1602 MONITOR AND CONTROL SYSTEM

P.N. 801-1602

DOCUMENT No. 025-1602

December 1988

Data, drawings and other material contained herein are proprietary to Computer Process Controls, Inc. and may not be reproduced without the prior approval of Computer Process Controls.

Computer Process Controls, Inc.
1275 Kennestone Circle, Suite 100
Marietta, GA 30066 (404) 425-2724

CPC

TABLE OF CONTENTS

Section/Paragraph	
1.0	**GENERAL INFORMATION**
1.1	Introduction
1.2	General Description
1.3	Operator Terminal
1.4	Wiring
1.5	Optional Equipment
1.6	Technical Characteristics
2.0	**INSTALLATION**
2.1	General
2.2	Pre-Installation
2.3	Mounting
2.4	Field Wiring
2.5	Operator Terminal Connection
2.6	Modem Connection and Installation
2.7	Remote Communications Bus Wiring
2.8	Expansion Enclosure Installation
3.0	**STARTUP/CHECKOUT**
3.1	Before Turning the Power On
4.0	**DESCRIPTION OF OPERATION**
4.1	General
4.2	Control Functions
4.3	Monitor Functions
4.4	Alarms/Notices
4.5	Expansion Network
5.0	**PROGRAMMING THE 1602**
5.1	General
5.2	Menus
5.3	Passwords
5.4	Logging On to the 1602
5.5	Logging Off
5.6	Programming/Monitoring Procedures
5.7	Expert Mode
5.8	Programming Entry

6.0 CONTROL STRATEGY GUIDE

6.1 General
6.2 Phase Loss
6.3 Overrides
6.4 Digital Input Overrides
6.5 Schedules
6.6 Demand Limiting
6.7 Duty Cycling
6.8 Analog Sensor Control
6.9 Defrost
6.10 Inverted Outputs
6.11 Logging

7.0 TROUBLESHOOTING

7.1 General

8.0 PROGRAMMING FORMS

8.1 General

9.0 PARTS LIST

9.1 General

10.0 GLOSSARY OF TERMS

LIST OF ILLUSTRATIONS

Figure	Title
2-1	Typical Wiring Methods
2-2	Setting Baud Rate on 1602
2-3	Hayes Smartmodem Switch Settings
2-4	Typical Mounting Installation
5-1	1602 Menu Flowchart
9-1	Location of 1602 Circuit Boards

LIST OF TABLES

Table	Title
1-1	Technical Characteristics
2-1	Recommended Wire
5-1	Operator Programming Guide
7-1	Troubleshooting Guide
7-2	System Alarms
7-3	Network Alarms
9-1	1602 Standard Parts List
9-2	1602 Optional Parts List

PREFACE

1. GENERAL DESCRIPTION. The CPC 1602 Monitor and Control System is a general purpose control system designed to minimize energy usage in small and medium sized buildings. The 1602 Monitor and Control Unit (MCU) may be expanded from 48 to 104 control and monitor points by connecting the 1602 through a communications network to optional Expansion Board Enclosures . A variety of control strategies and monitoring capabilities are available with each 1602 application.

2. CONTENTS. This manual consists of the following sections:

SECTION I	General Information
SECTION II	Installation
SECTION III	Startup/Checkout
SECTION IV	Description of Operation
SECTION V	Programming the 1602
SECTION VI	Operator Function Guide
SECTION VII	Troubleshooting
SECTION VIII	Programming Forms
SECTION IX	Parts List
SECTION X	Glossary

3. USE OF THIS MANUAL. This manual contains information necessary to install, operate, and maintain the Computer Process Controls 1602 Monitor and Control Unit (MCU). The table of contents indicates sections, paragraphs, and titles to facilitate location of information. Illustrations, tables, and diagrams, when applicable, are placed throughout the publication to supplement the text material. Lists of illustrations and tables indicate the numbers and titles. Abbreviations, phrases, and words are set forth in the text exactly as they appear on the equipment. A glossary in Section X gives definitions of certain terms unique to this product and its application.

STUDY THIS MANUAL CAREFULLY PRIOR TO

INSTALLING AND OPERATING THIS SYSTEM

SECTION I

GENERAL INFORMATION

1.1 GENERAL DESCRIPTION. The Computer Process Controls 1602 Monitor and Control Unit (MCU) is a stand alone unit that will monitor 32 inputs and control 16 outputs (24VAC). Inputs 1 thru 16 are analog (sensor) inputs, and 17 thru 32 may be either digital (dry contacts) or analog (sensor) as defined by the user.

With the addition of up to 2 CPC 16AI Expansion Boards (16 Analog or Digital Inputs each) and up to 3 CPC 8RO Expansion Boards (8 Relayed Outputs each), the 1602's total number of inputs is 64 and outputs is 40. The 16AI Expansion Board's inputs may be defined as either analog or digital. The 16AI and 8RO Expansion Boards communicate with the 1602 on the "Expansion Communication Bus" (ECB). The purpose of the ECB is to allow the Expansion Boards to be mounted closer to the devices being monitored or controlled. Since a single 2-conductor shielded-wire communication line runs from the 1602 to an Expansion Board, input and output wiring runs will be shorter and less installation time will result.

Each 1602 controller has connections for a "Remote Communications Bus" (RCB). The purpose of the RCB is to allow an operator to monitor and program the 1602 from a remote location using a modem and telephone lines or from an on site terminal. The CPC Intelligent Pressure Control and the Intelligent Environmental Control may also be connected to the RCB.

Some of the features of the CPC 1602 MCU are:

Inputs	- Monitoring of temperature, pressure, dewpoint,etc. and detecting digital input on/off states
Alarms	- Programmable alarm setpoints for all inputs
Schedules	- Conrol outputs by time, day, night set back, week and holidays
Outputs	- Control outputs by phase loss, manual overrides, digital overrides, schedules, demand setpoints, and duty cycling, and mutiple sensors
Overrides	- Manually turn outputs on or off
Duty Cycle	- Automatically turn outputs on/off for a specific amount of time or by sensor control
Demand	- Set winter/summer demand targets (KWH) and try to achieve them by shedding specific outputs
Phase	- Automatically turn outputs off when phase loss is detected
Defrost	- Automatically perform up to 6 scheduled defrost per day. Defrost types can be hot gas, electric, or off cycle.
Logging	- Battery backed up hourly, daily, override, analog and digital inputs, unacknowledged and acknowledged alarms, and runtimes for digital inputs and outputs.

1.3 OPERATOR TERMINAL. Computer Process Controls offers a variety of terminals to meet the customer's needs for both local and remote applications. Computer Process Controls has made every effort to make the 1602 compatible with most data terminals and personal computers operating in the "Data Terminal" mode. The communication is done using the industry standard RS-232 and sent in ASCII format. We recommend the following two types of terminals. One is a printing terminal, the other a video terminal.

PRINTING	CPC P.N. 380-0707
VIDEO	CPC P.N. 380-0905

1.3.1 OPERATOR TERMINAL SET UP. Using the terminal instructions, set the terminal up with the following parameters:

- 8 Data bits per character
- No parity
- One stop bit
- Baud rate to match modem and 1602 selection (300, 1200, or 2400). See Figure 2-2 for instructions for setting baud rate on the 1602.

1.3.2 REMOTE COMMUNICATIONS. If the terminal does not have a built-in modem, connect an external modem, following the modem and terminal manufacturer's instructions. The modem must be Hayes 1200 Smartmodem for proper receiving of incoming calls. Hayes brand modems are used by CPC, Inc. since they have proven to be dependable and almost immune to line noise. See "Operator Terminal Connections" for direct connection (no modem) of the operator terminal to the 1602.

1.4 WIRING. All input/output wires are connected to the terminal blocks supplied in the 1602 enclosure. These may be removed without disconnecting the wires. See Section II for details.

1.5 OPTIONAL EQUIPMENT. The 1602 may be modified or enhanced with the following optional equipment (see "Optional Parts List"). Contact CPC for any additional information for 1602 options.

a. 300 or 1200 Baud telephone modem
b. Sensors for temperature, 0-100 psig transducers, 0-500 psig transducers, humidity sensors, dew point sensors, refrigerant level sensors, and light level sensors.
c. Control relays
d. Expansion Board Enclosures to increase the number of 1602 inputs and or outputs
e. Alarm Receiver Packages for off-site alarm receiving.
f. Addition of Intelligent Pressure Controls and Intelligent Environmental Controls on the 1602 communications bus.
g. Additional 1602 MCU's for increased capability.
h. Orion Front End System Data-Pak Software (P.N. 804-1660) for IBM Personal Computers. Enables user to retrieve logs, restore set points, back up set points, and organize information.

1-6 TECHNICAL CHARACTERISTICS. Technical Characteristics of the system are shown in Table 1-1.

Table 1-1. Technical Characteristics

Components	Characteristics
Microprocessor	8085A-8 bit
Communications	RS-232 Interface for Remote Communication Network. 300, 1200, or 2400 baud. Compatible with Hayes Smartmodem commands. RS-485 Interface for the Expansion Communication Network. 1200, 2400, or 4800 baud.
Front Panel Display	L.E.D. indicator for power, processor run, transmit and receive data.
Field Outputs	24 VAC fused (pica fuse), 30 VA total output for 16 combined. Maximum 12 VA each output.
Field Analog Inputs	-1 to +7 VDC
Field Digital Inputs	Dry contact inputs.
Phase Loss Input	Dry contact closure to Input #32 (Digital) from phase monitor device. One millisecond reaction time.
KWHR and KW Input	Pulse input to Input #31 (Digital).
Power Supply	120 VAC, 1 amp.
Failure Protection	-Normally Closed Outputs for fail on. -Normally Open Outputs for fail off if desired. -Watchdog timer resets processor every 5 seconds in the event of a failure. -Output board automatically turns on all outputs when processor is stopped for one minute. Alarm contacts close. -When multiple Outputs require turning on simultaneously, 2-3 second staging occurs -Non volatile memory saves set points, logs and names. -8RO and 16AI Expansion Boards Failure Protection (explained in individual manuals)
Physical Dimensions	-15" wide X 24" high X 5.5" deep.
Mounting Holes	-7.0"wide X 21.5" (0.25" holes)
Weight	-Approx. 42 lbs.

SECTION II

INSTALLATION

2.1 GENERAL. This section contains suggestions and factors to consider during the pre-installation and installation phases of the CPC 1602 system. Close adherence to the suggestions will assure satisfactory performance from the equipment.

2.2 PRE-INSTALLATION. Prior to receiving the 1602 control unit(s), the sensors and interface relays may be installed. All wiring should conform to National Electrical Codes (NEC) and all local codes.

2.2.1 WIRING PROCEDURES. Table 2-1 gives suggested wire gauge and approved CPC part numbers. Shields are grounded only at the 1602 control unit. For best results use only stranded type TFF wire, #18 awg or smaller. Larger wires will not fit properly into the terminal blocks of the 1602.

2.2.2 UTILITY MONITORING. If you will be monitoring KW and KWHR usage, the 1602 needs a DRY CONTACT pulse input. This can be supplied by a pulse generating meter or combination current transformers and watt hour transducer. Contact CPC or your local utility for more information. The pulse rate should be from a form "A", two wire connection, 10 to 100 watts/pulse. In general, the lower this ratio (watts/pulse) the better your resolution will be.

2.2.3 SENSOR LOCATION. In general, sensor location should be considered carefully. A misplaced sensor will cause poor control, poor product integrity, and discomfort in building environments. NOTE: SENSOR WIRES SHOULD NOT BE PULLED IN THE SAME CONDUIT AS HIGH VOLTAGE WIRING. CPC IS NOT RESPONSIBLE FOR INACCURATE READINGS FROM INSTALLATIONS USING NON-SHIELDED SENSOR CABLES.

a. Refrigerated Cases - Install temperature sensors in the discharge air stream where they may be checked and serviced without disassembly of the case.

b. Walk In Coolers - Install temperature sensor in the center of the cooler in the air flow from the coils.

c. Room temperature - Locate in a central area away from external influences such as entrances or refrigerated cases. If in a supermarket or retail store, we suggest a location two/thirds of distance towards the front of the building, near check out counters.

d. Dew Point - Locate away from refrigerated cases where sufficient room air movement is present.

2.2.4 POWER INPUT. Power input is a dedicated, 120 VAC system.

2.2.5 CONTROL OUTPUTS. Control outputs are 24 VAC. Outputs are 0.0 VAC when a load is commanded "ON", 24.0 VAC when a load is commanded "OFF". Inverted loads operate just the opposite. (See Section 6.9). A total of 20 field relays may be connected to each 1602 MCU. Do not connect more than six field relays to any one 1602 output. Use CPC Part Number 896-0004 for field relays. Connect loads to the Normally Closed contacts (N.C.) for fail on wiring for non inverted outputs, or to the Normally Open contacts (N.O.) for fail off wiring of inverted outputs.

NOTE: The 8RO Expansion Board outputs may or may not supply the 24 VAC (see the "Optional Parts List"). The 8RO board provides jumper selectable N.O. or N.C. contacts.

2.2.6 REMOTE COMMUNICATIONS. If the unit is to be configured for operation over a remote terminal, the telephone company must be contacted to install a telephone line. They will require the following information:

a. Line Type - Voice Grade, Tone Dial
b. FCC Registration Number - BFJ9D9-68737-DME
c. Ringer Equivalence: 0.4db
d. Termination to RJ11C jack, or equal to modem specs.

2.3 MOUNTING. The 1602 MCU is supplied with four mounting holes for wall mounting. The unit should be mounted such that the field wiring may be conveniently routed into the conduit holes in the bottom of the enclosure. Because 120 VAC independent power is required, proximity to a power source is also desirable. See Table 1-1 dimensions and Figure 2-4 for Typical Mounting Installation.

2.4 FIELD WIRING. Table 2-1 gives recommended wire specifications for field connections. Figure 2-1 shows typical wiring connections.

2.5 OPERATOR TERMINAL CONNECTION. To connect an operator local terminal to a 1602 MCU use cable # 535-1017 which includes transmit data, receive data, and common. There is a connector on the Field Input Board for this cable. See Figure 2-1. In addition, a jumper wire needs to be in place between terminals #206 #208. This should have been factory installed, but check to insure the jumper is in place. Connect the terminal as follows:

Local Terminal	Cable #	1602
Data Terminal Transmit---}	535-1017	{---
Data Terminal Receive ---}----------		{--- connector on the
Data Terminal Common ---}		{--- Input Board

See Figure 2-1 for the location of the connections to the 1602 MCU. Before operating the terminal, follow the instructions in paragraph 1.3.1, SETUP.

Note that when using a network of CPC units, you may parallel your operator terminal connections with the "Remote Communications Bus" (RCB). This allows communications with any device on the network from any location on the RCB.

2.6 MODEM CONNECTION AND INSTALLATION. Use CPC's Part Number 370-0300, 370-1200, or 370-2400 telephone modem. The telephone modem is supplied with cable assembly #535-1015, power supply, and telephone connecting wire. Mount the telephone modem near any 1602 MCU, preferably device #1. Proximity to the telephone jack as supplied by the telephone company is also desirable. A 115 VAC duplex outlet is required for power to the modem's transformer. Install as follows:

a. Mount the modem using the supplied bracket.
b. Connect the modem connector into the modem.
c. Connect the loose end of the modem cable #535-1015 to the 1602.

Modem Wire No.	1602 Terminal No.
#2 Rx (Receive)	#202 Tx (Transmit)
#3 Tx (Transmit)	#203 Rx (Receive)
#7 (shield)	#201 (shield)
#20 DTR	#205 DTR

d. Plug in the modem power pack into a duplex outlet, and into the power jack at the back of the modem.
e. Plug the telephone wire into the back of the modem and into the wall jack.
f. Set the Modem "DIP" switches according to Figure 2-3
g. Turn on the power to the modem using the switch on the back of the unit.

2.7 REMOTE COMMUNICATIONS BUS (RCB) WIRING. When you are installing multiple MCU's, or connecting the 1602 to the Intelligent Pressure Controls or Intelligent Environmental Control for remote communications, each unit must be connected to the RCB. This bus is a 3 conductor shielded cable (Belden #8771). The connection between 1602 units is parallel, or "daisy chain" fashion on terminals #201, #202, and #203. When connecting to Intelligent Pressure Controls and or Intelligent Environmental Control, follow this table:

1602 Terminal No.	IPC Terminal No.	IEC Terminal No. J1
#201 (shield)	#1	#1 Green
#202 (transmit)	#2	#2 Red
#203 (receive)	#3	#3 Black

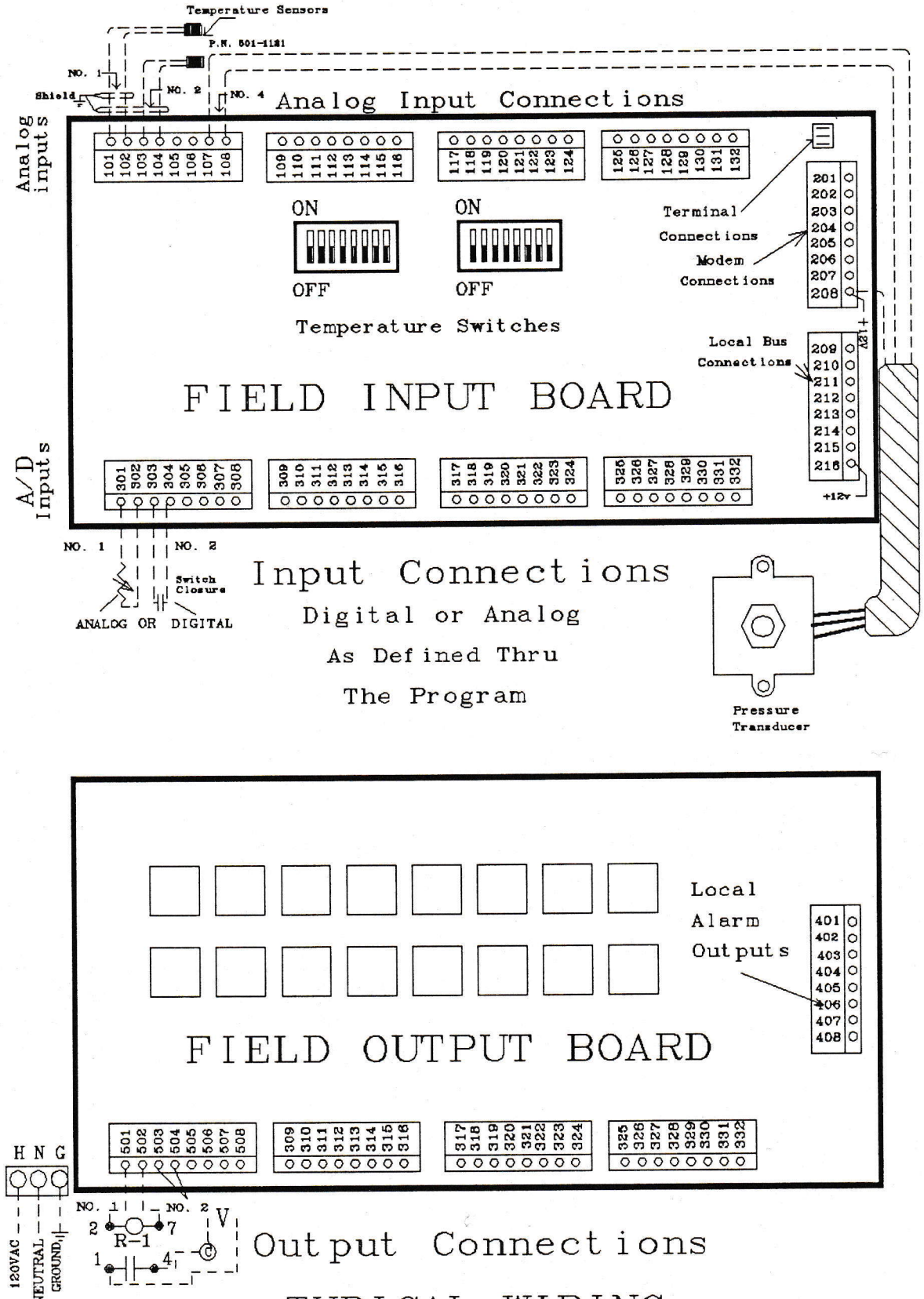
DO NOT INTERCONNECT EACH DEVICE ON THE REMOTE COMMUNICATIONS BUS UNTIL EACH DEVICE HAS BEEN ASSIGNED A UNIQUE DEVICE NUMBER. SEE TABLE 5-1, SECTION 10-3 FOR INSTRUCTIONS ON SETTING THE 1602 DEVICE NUMBERS. TO SET THE IPC AND IEC DEVICE NUMBERS, SEE THE IPC COMMUNICATIONS MANUAL AND THE IEC MANUAL RESPECTIVELY.

2.8 EXPANSION ENCLOSURE INSTALLATION. If the optional 16AI and or 8RO Expansion Boards are used, refer to the "Expansion Board Enclosure Manual" for mounting details. A site close to the devices being monitored or controlled can be chosen as long as 120VAC is readily available to power the unit.

2.8.1 EXPANSION COMMUNICATION BUS (ECB). The 1602 needs 2 jumper wires to be in place on the Field Inputs Board Expansion Bus Terminal Block (see Figure 2-1). If jumpers have not been factory installed, connect one between terminals #212-#213, and one between #214-#215. As with the Remote Communications Bus, the Expansion Enclosures may also be connected in parallel on the ECB. The ECB wiring consists of a 2-conductor shielded-wire cable (Belden #8451 22 gauge or #9154 20 gauge for long runs) connected between the 1602 and the Expansion Board (16AI or 8RO) as follows:

1602 MCU RS-485 Terminal Block	Expansion Enclosure RS-485 Bus Connector	
209	Ground	(0 V, shiled)
210	Comm +	(485 +, red)
211	Comm -	(485 -, black)

If you are utilizing one or more 8RO Boards (P.N. 801-3000) or 16AI Boards (P.N. 801-3010), refer to the manuals that are supplied with them, manual part numbers 025-3000 and 025-3010 respectively.

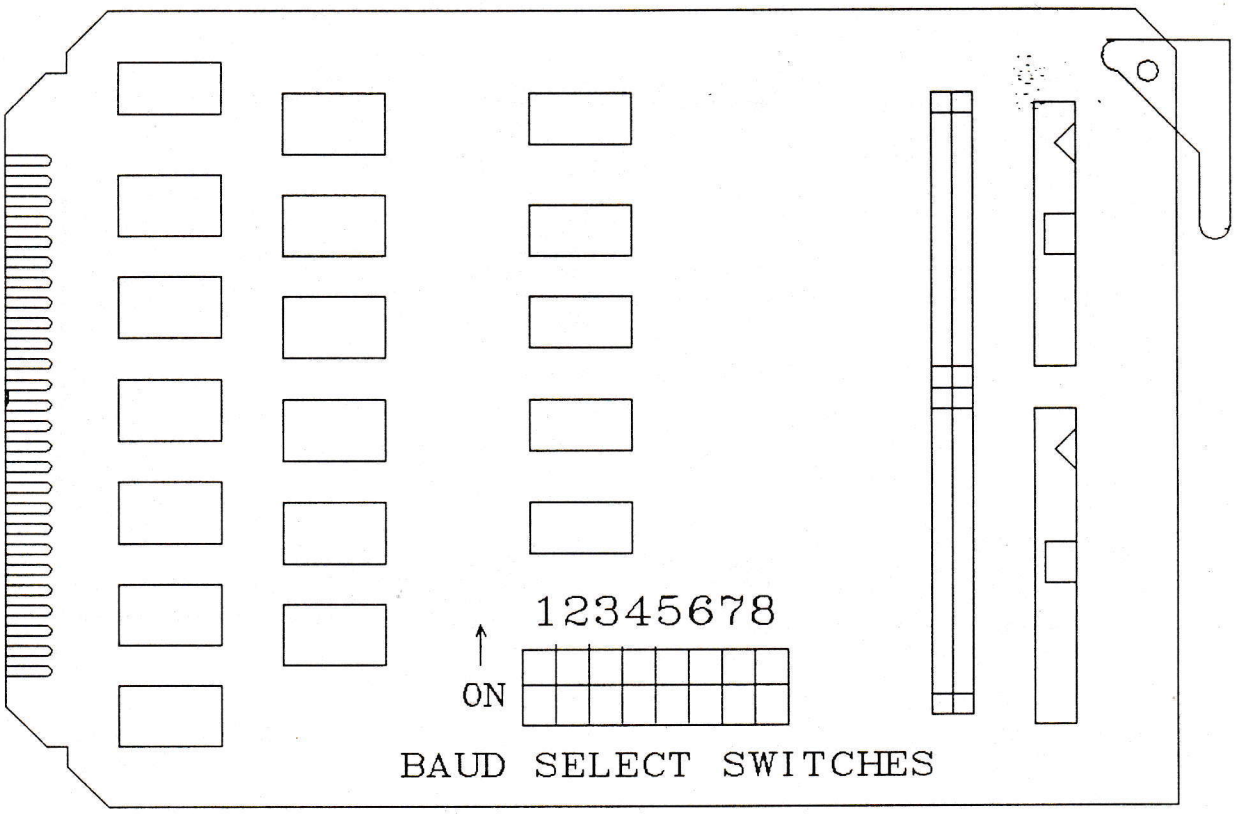


TYPICAL WIRING

FIGURE 2-1

This card is located 2 nd up from bottom.

(See Figure 9-1 Page 9-3)



DIGITAL I/O CARD

P.N. 537-1650

TO SET BAUD RATE:

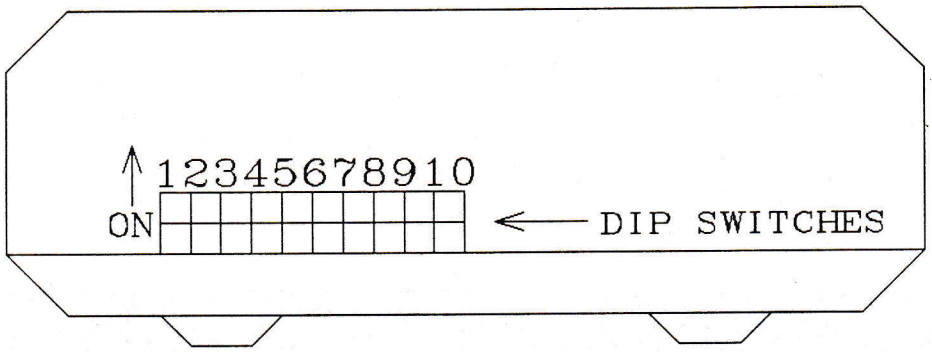
1. Turn power off.
2. Remove Digital I/O card from holder.
3. Set switches per the table below.
4. Replace board. Make sure it is seated.
5. Turn power back on.

NOTE:

SWITCHES 5 TO 8 ARE NOT USED

	RS-232		RS-485	
BAUD RATES	REMOTE BUS		EXPANSION BUS	
SWITCH NO. →	1	2	3	4
300	0	0	N/A	N/A
1200	1	0	0	0
2400	0	1	1	0
4800	N/A	N/A	0	1
9600	1	1	1	1

SETTING BAUD RATE
FIGURE 2-2



SWITCH NO.	POSITION
1	DOWN
2	UP
3	DOWN
4	DOWN
5	UP
6	UP
7	UP
8	DOWN
9	UP
10	UP

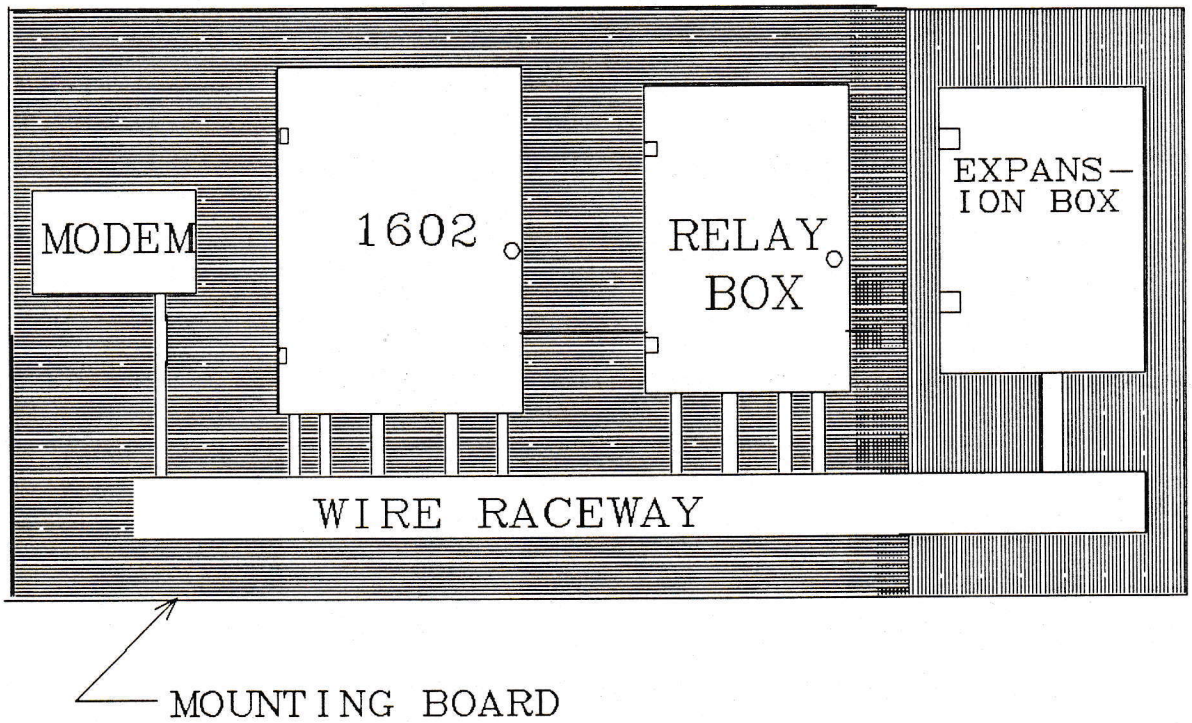
NOTES: 1200 BAUD MODEM SHOWN

- 300 BAUD HAS ONLY 8 SWITCHES
- POSITIONS 1 THROUGH 8 ARE IDENTICAL TO 1200 BAUD MODEM
- TO OBTAIN ACCESS TO SWITCHES REMOVE MODEM FRONT COVER

HAYES SMARTMODEM

SWITCH SETTINGS

FIGURE 2-3



TYPICAL INSTALLATION

FIGURE 2-4

Table 2-1. RECOMMENDED WIRE

Terminal Numbers	Function	Recommended Wire
101 to 132	Inputs 1 to 16 (Analog) Odd numbers are Common, Even numbers are Signal. Connect all shields to chassis ground or any common.	Belden #8762 #22-2 Shielded
201 202 203	Terminal/Modem common Transmit to Terminal/ Modem. Receive from Terminal/ Modem.	Belden #8772 #22-3 Shielded
204	+5 VDC not used.	Not used.
205	Communications Data Terminal Ready.	Not used.
206	Communications Clear To Send - Connect to #208.	Jumper wire.
207	Common.	
208	+12 VDC to Pressure Transducers and #206.	Belden #8772 #22-3 Shielded
209	Expansion Bus Common.	Belden #8451 #22-2 shielded-wire
210	Expansion Bus Transmit.	
211	Expansion Bus Receive.	
212	+5 VDC. Connect Jumper Wire to #213.	Jumper Wire |
213	Data Terminal Ready. Connect Jumper wire to #212.	Jumper Wire
214	Clear to Send. Connect Jumper Wire to #215.	Jumper Wire |
215	Common. Connect Jumper Wire to #214.	Jumper Wire
216	+12 VDC. (not used)	

Table 2-1 Continued. Recommended Wire

Terminal Numbers	Function	Recommended Wire
301 to 332	Inputs 17 to 32 (Digital) or (Field selectable as additional Analog Inputs) Odd numbers are common. Even numbers are signal (i.e. #301 and #302 are D.I. #17 or A.I. # 17) NOTE: FOR DIGITAL INPUTS USE DRY CONTACTS ONLY!!	#22-2 Twisted Pair.(Digital) or Belden #8762 #22-2 Shielded (Analog)
401	24 VAC	Not used.
402,403	Pulse Output Alarm for Pulse input dialers.	Belden #8762 #22-2 Shielded.
404	24 VAC	Not used.
405	24 VAC	Not used.
406, 407	Latched Alarm 1 Amp max.	In compliance with local and N.E.C.
408	24 VAC	Not Used.
501-532	24 VAC Control Outputs Odd numbers are 24 VAC Even numbers are common (i.e., 501 is Output #1 24 VAC. 502 is Output #1 Common.)	#22-2 Twisted Pair.
TB1-1	120 VAC	In compliance with local codes and N.E.C.
TB1-2	Neutral	
TB1-3	Ground	

NOTE: UNIT MUST BE GROUNDED!!!!!

SECTION III

STARTUP/CHECKOUT

3.1 BEFORE TURNING THE POWER ON. Prior to turning the power on, you must do the following:

3.1.1 DISCONNECT OUTPUTS. Disconnect the outputs by removing the terminal blocks along the bottom edge of the field output board. This will insure that the control relays remain in their normal (fail safe) position during the startup procedure.

3.1.2 SET THE ANALOG INPUT (1-16) SWITCHES. See Figure 2-1. The switches should be "up" for temperature sensor inputs and down for other type sensors. Set the switches in the "up" position for any spares. If any of the Input Terminals 17 thru 32 are to be programmed for use as analog inputs refer to Table 5-1 MENU/FUNCTION 10.10 for program instructions. Note: Inputs 17 thru 32, where used as analog, may be used for temperature sensors only. Check with CPC for any other analog use of these.

3.1.3 RECHECK WIRING. Recheck the wiring at the 1602 unit. Make sure jumpers are installed between terminals #206-208, and between terminals #212-#213 and #214-#215.

3.1.4 DISCONNECT THE EXPANSION COMMUNICATION BUS. Remove the lower terminal block on right side of the field inputs board that connects the 1602 to the Expansion Communication Bus.

3.1.5 CONNECT YOUR OPERATOR TERMINAL. Connect your data terminal using instructions in Section 1.3.1 and in Section 2.5. Insure that the baud rate is selected properly on the terminal and the 1602 controller(s). See Figure 2-2.

3.1.6 TURN ON THE POWER. Turn on the power switch located in the 1602 unit. It should illuminate; if not, check incoming power. When powered up, the indicator lights on the unit door should be as follows:

a. +12, -12, +5 lights should be illuminated.

b. Running light should be blinking on and off.

c. Transmit and Receive lights should be off.

If you have any problems, see Section VII, Troubleshooting, for more information.

SECTION IV

DESCRIPTION OF OPERATION

4.1 GENERAL. The CPC 1602 MCU is designed to be a total Monitoring and Control System. Through it's simplicity of operation, it is designed to meet the needs of the most demanding application. The 1602 has a variety of control functions built into it's software. Each output can be controlled by eight separate control strategies or by any combination of the eight or all eight together. The nineth item below, defrost, works independently of the first 8 strategies only when an actual defrost is in progress. When a defrost schedule is idle, waiting for the next defrost time, the outputs operate under the control of the first 8 strategies. The output control strategies are as follows:

1. Phase Loss protection
2. Fixed or Timed Overrides ON or OFF.
3. Up to 2 Digital Input Overrides on each Output. Overrides can be either ON or OFF.
4. Schedule Control
5. Night Setback Schedule Control
6. Demand Limiting
7. Duty Cycling
8. Sensor Control (temperature, pressure, dew point, etc.)
9. Scheduled Defrost Control.

4.2 CONTROL FUNCTIONS. Each output of the 1602 is controlled by the following control strategies as listed in sequence of priority of their control.

4.2.1 PHASE LOSS. Input #32 (Digital) may be used as an input from a phase monitor, CPC P.N. 231-0258. If poor power is detected, Input #32 closes and all loads assigned to phase loss are turned off. See Control Strategy Guide, Page 6-1, for more information.

4.2.2 OVERRIDE. Each output may be overridden from the operator terminal. The override can force an output ON or OFF for a timed period or until manually removed by the operator. Each override is stored in an Override Log. See Control Strategy Guide, Page 6-1, for more information.

4.2.3 DIGITAL INPUT OVERRIDE. One or two digital inputs may be assigned to each output and set to force the output ON or OFF when the digital input closes. Digital Input Override #1 has a higher priority than Digital Input Override #2. See Control Strategy Guide, Page 6-2, for more information.

4.2.4 SCHEDULE. Each output may be assigned to one of 12 schedules, each having 24 different events. (i.e., ON at 8:00 a.m. is an event). Six types may be set for events (WK for Sun.-Sat., Holiday 1, Holiday 2, Holiday 3, MF for Mon.-Fri., or each day may be set separately). See Control Strategy Guide, Page 6-2, for more information.

4.2.5 NIGHT SET BACK. Each output may be assigned a Night Set Back Schedule (same definition as Section 4.2.4 SCHEDULE) and setpoint values to revert to when under control of this schedule. See Control Strategy Guide, Page 6-2, for more information.

4.2.5 DEMAND LIMITING. Each output may be designated for demand shedding. Outputs are shed by priority, maximum shed time, and minimum on time. In addition, an analog sensor input limit may override an output set for shedding. Winter and Summer targets may be selected for Demand control. See Control Strategy Guide, Page 6-3, for more information.

4.2.6 DUTY CYCLING. Each output may be set for Duty Cycling. An ON time from 0 to 240 minutes and an OFF time from 0 to 240 minutes may be set. Also, an analog sensor input limit may override an output for Duty Cycling. See Control Strategy Guide, Page 6-4, for more information.

4.2.7 ANALOG SENSOR CONTROL. Each output may be assigned up to four sensors for control using average, minimum, or maximum values. Day cut-on, cut-off, On delay, Off delay, and night set back cut-on and cut-off may be set. The night set back schedule is determined by one of the 12 regular schedules. See Control Strategy Guide, Section 6.8, for more information.

4.2.8 SCHEDULED DEFROST CONTROL. The defrost control can provide up to 6 scheduled defrosts per day. The defrost types available are hot gas, electric, and off cycle all 3 allowing termination by time, temperature, and or digital input. See Control Function Guide, Section 6.9, for more information.

4.3 MONITORING FUNCTIONS. A number of monitoring functions are standard with each 1602 MCU to assist the operator in determining problems at the site under control and to improve maintenance. Monitoring functions such as, List Definitions and Set Points, List Status, Present Analog and Digital Inputs, Logging Data, and All Alarms and Notices, are just a few of the standard functions.

4.3.1 ANALOG SENSOR READINGS. Current readings of all Analog Inputs can be monitored. Also, a single Analog Input can be monitored continuously. When the unit is monitoring a single input, the 1602 will update the value of that input on the screen every 5 seconds. Current status displays the following information for all Analog inputs or continuously for a single input:

		Present	Today		Yesterday		This Week		Last Week	
#	Name	Value	High	Low	High	Low	High	Low	High	Low

4.3.2 DIGITAL STATUS LISTINGS. Current status of all Digital inputs can be monitored. This listing shows Current on/off status, On time, Accumulated Events, Last ON duration, Last OFF duration, And ON & OFF Delay Timer times remaining.

4.3.3 OUTPUT STATUS LISTINGS. Current status of all Outputs can be monitored. The output listing shows Current on/off status, which control scheme is controlling the output currently, if inverted or not, and the run time of that output.

4.3.4 LOGS. Several logs are continuously kept for useful information about past performance of equipment. See Control Strategy Guide, Page 6-5, for more information.

4.3.4.1 HOURLY LOG. Lists by hour for 48 hours usage, KWH usage, KW peak, and average outside temperature.

4.3.4.2 DAILY LOG. Lists by day for 48 days the KWH usage, KW peak, time of peak, High and Low temperatures for the day.

4.3.4.3 OVERRIDE LOG. Lists the history of up to 64 overrides by output name, number, and type (fixed or timed). If the override is timed, the Override log tells how long the override lasted.

4.3.4.4 ANALOG INPUT LOG. Lists up to 128 previous readings. The interval between readings is set in the Analog Input definition.

4.3.4.5 DIGITAL INPUT LOG. Lists up to 9 days of Digital Input information. This information consists of On time and Accumulated Events as of Midnight.

4.3.4.6 UNACKNOWLEDGED ALARM/NOTICE LOG. Logs all Unacknowledged alarms and notices. Up to 128 alarms and notices may be stored in this Alarm/Notice log.

4.3.4.7 All ALARM/NOTICE LOG. Logs all Unacknowledged and Acknowledged alarms and notices. Up to 128 alarms and notices may be stored in this Alarm/Notice log.

4.4 ALARMS/NOTICES. Alarms and/or notices may be set for abnormal conditions. An alarm causes the local alarm output to close and the 1602 to dial one of two telephone numbers if so connected. A notice is simply stored in the Alarm/Notice log for future reference.

4.4.1 ALARM DIAL OUT. The 1602 will dial out up to two phone numbers in the event of an alarm. Each number is "qualified" when an assigned schedule is on. The dial out sequence operates as follows:

When an alarm occurs, the 1602 will wait 1 minute before dialing the first number. If the 1602 is unsuccessful making the call or the answering modem does not connect, it will wait five minutes and then repeat the process. The 16022will try to dial the first number every five minutes until it has tried six times. Then it will dial the second number and try up to six times, dialing every five minutes. If unsuccessful, the 1602 "gives up". NOTE: THE TWO PHONE NUMBERS MUST BE AT LEAST SEVEN DIGITS LONG. ALSO, THE DIAL OUT SCHEDULE MUST BE "ON" IN ORDER FOR THE 1602 TO DIAL.

4.4.2 ANALOG ALARMS/NOTICES. High and low limits may be set up for up to 64 analog alarm conditions. A notice and an alarm may be set for the same input. Alarm delays may be set to prevent nuisance alarms.

4.4.3 DIGITAL ALARMS/NOTICES. Up to 64 alarms and/or notice conditions may be set for the Digital inputs. Types of conditions are:

1. Status of Digital Input = ON
2. Accumulated Events
3. Last ON duration (min.)
4. Accumulated ON time (hrs.)
5. Events/time interval
6. Last OFF duration (min.)

4.5 EXPANSION NETWORK. The Expansion Communication Bus along with the Expansion Communication Network software allow the 1602 to more then double the standard number of 1602 inputs and outputs. The input and output status display screens and the 2 LED's on the 1602 Field Inputs Board next to the Expansion Communication Bus terminal block can be used to monitor the state of the Network.

4.5.1 RECONFIGURATION. On power up the 1602 will try to get the communication started by "looking" for any Expansion Devices on the Expansion Bus as long as the Expansion Communication Network is turned ON (see table 5-1, Section 13.3). This reconfiguration occurs once every 5 minutes if the 1602 does not "find" any Expansion Devices or loses existing communication with all devices (e.g. someone unplugs an Expansion Enclosure power or communication line). The 2 Network LED's will both flash on and off when the 1602 is "looking" for Expansion Devices in this reconfiguration state.

4.5.2 NORMAL OPERATION. If the 1602 is communicating with 1 or more Expansion Devices, the top Network LED should flash several times a second, and the bottom Network LED should stay ON. In order for the 1602 to actually read inputs from a 16AI and turn outputs on/off on an 8RO, sequential device numbers (starting with 1) must be assigned for the boards through the SYSTEM INFO MENU (See Table 5-1, Section 10.3 and the "Expansion Enclosure Manual"). The ONLINE/OFFLINE communication status of the Expansion Devices can then be observed through the input and output status dispalys in the INPUT MENU and OUTPUT MENU respectively.

4.5.3 SAFTEY FEATURES. As with the reconfiguration explained above, several other "self correcting" protection features exist in the Network software to allow Expansion Board inputs and outputs to go to a predetermined state in the event of communication failure. Any Expansion Device that stops communicating will be checked by the 1602 once a minute until the device starts "talking" again or its device number is manually removed (See Table 5-1, Section 10.3).

4.5.3.1 16AI EXPANSION BOARD. If a 16AI Expansion Board quits communicating, the inputs defined as analog go to the OPEN state and the inputs defined as digital go to an operator programmed default state of OPEN or CLOSED (See Table 5-1, Section 1-7). Outputs controlled by analog sensors can be programmed by the operator to turn ON or OFF if that sensor fails (See Table 5-1, Section 4.4). Outputs controlled by digital overrides will also go to a known state if the digital input is on a 16AI Board that fails.

4.5.3.2 8RO EXPANSION BOARD. The 8RO Board outputs will go into a known state (Failsafe) in the event of communication or power failure. The "Failsafe Outputs" on the 8RO are jumper selectable to a normally open (N.O.) or normally closed (N.C.) position. As stated above, the outputs controlled by analog and or digital inputs go into a known state if the input should fail.

SECTION V

PROGRAMMING THE 1602

5.1 GENERAL. Operation of the 1602 is done through a standard data terminal connected directly to a 1602 Monitor Control Unit (MCU) or over a standard dial up telephone line. Proper modems and connections must be installed as described in Section II for operation over a remote terminal. The 1602 Control and Monitor System is designed to control and monitor all types of mechanical equipment. A variety of control capabilities are built into the 1602 software. These operating instructions are written in the order that an operator might initially program a 1602 MCU. To find a particular operation, look in the Operator Programming Guide for the particular section that will help you.

5.1.1 Pre-Operation. Prior to beginning operation of the 1602, insure that the following are done.

a. Baud rate, parity, and data bit settings are set on your terminal to match the 1602 and modem(if used). See Section 1.3.1.

b. Each 1602 MCU, IPC, and IEC has been assigned a unique device number from 1 to 99. See Paragraph 5.4.

c. Each 16AI and 8RO Expansion Board connected to a 1602 has all the hardware switches set properly. The 16AI and 8RO Expansion Bus Device Numbers do not have to be unique (i.e. 16AI and 8RO are different board types so they can both be assigned device number "1").

d. All 1602 MCU's are running per the startup instructions.

e. Your terminal is connected to the 1602 communication connection per section 2.5.

5.1.2 Special Notes On Operation. The following should be noted as general characteristics of the 1602 operation.

a. The <CR> (Carriage Return) will normally "back you up" in the system menus. I.e., pressing <CR> when a sub-menu is being displayed will display the MAIN MENU. The <CR> will also terminate displaying of almost all the status, log, and definition dispalays.

b. Backspace and Delete keys may be used to correct mistakes

c. Information in [brackets], followed by a "?", is what is presently stored in memory for that selection. Pressing <CR>, at the "?", will NOT change the item in memory.

d. Input, Output, and Schedule names may be 10 characters.

e. Pressing Control <CTRL>, holding it down, and then pressing S <S> will pause the screen. Pressing any other key will resume scrolling.

5.2 MENUS. The 1602 software is designed for simple operation. Menus and prompts, all written in easy-to-understand English, guide the operator thru initial system programming and day-to-day monitoring. Select a menu choice by simply pressing the number of the choice and <CR> (Carriage Return). In general, menus are shown in the order that you would initially program the unit. Table 5-1, Operator Programming Guide, outlines the steps required to use each menu selection. The Programming Guide numbering is identical to the menu numbers on your screen for easy identification.

5.3 PASSWORDS. Two passwords may be entered into each 1602 control unit. Level 1 password allows programming and monitoring. Level 2 allows monitoring only. Level 1 password is set to "123" prior to shipment. Level 2 password is set to "456" prior to shipment.

5.4 LOGGING ON TO THE 1602. For initial start up, since all 1602 MCU'S, IPC'S, and IEC'S have a factory set Remote Bus Device Number of "1", it is necessary to disconnect the communication wiring to all but one unit prior to logging on this first time. Next, key in the following 3 characters and Return <CR> to Log On.

"#" "$" "1" <CR>

The following should be dispalyed :

```
      COMPUTER PROCESS CONTROLS, INC.
           CPC-1602        REV X.XX

           (current name)

           Password:
```

Enter the correct password, (123 if a new unit), then <CR>, where <CR> is carriage return. The password will not be displayed for security reasons. The 1602 will respond with the MAIN MENU:

```
CPC-1602 MAIN MENU Mo/Da/Yr Hr:MnAM(or PM)
(Current Name)
-----------------------------------------
1. Inputs                 8. Phase Protect
2. Alarms                 9. Logging
3. Schedule              10. Sys. Info.
4. Outputs               11. Log Off
5. Override              12. Mail Box (contains mail)
6. Duty Cycle            13. Network
7. Demand                14. Defrost
?
```

Now select number 10, "Sys. Info.", and number 3, "Device", from the menu (See Table 5-1, Section 10.3). Enter the desired unique Remote Bus Device Number which will be used for all future Log On procedures.

The Expansion Bus Device Numbers which display next (shown below) can also be entered at this time. If your 1602 has 1 or more Expansion Boards connected to it, enter a "1" for the 1602 Expansion Bus Device number, otherwise enter a "0". If you have a full 1602 system (i.e 3 8RO and 2 16AI Exapansion Boards), number each expansion board sequentially, starting with "1" as shown below. Any lesser configurations would require the same numbering scheme with non-existing Expansion Boards given a device number 0 (undefined). Make sure the Expansion Board switch settings are set properly.

```
1602 Remote Bus Device # [1] ?          Enter a device # <CR>.

- EXPANSION BUS DEVICES -
Enter a valid Device # (1-16) or 0 (undefined)
   1602 Exp. Bus Device # [0]          Enter a "1" <CR> here.
   Outputs 17-24 Device # [0]                  "1" <CR>
   Outputs 25-32 Device # [0]                  "2" <CR>
   Outputs 33-40 Device # [0]                  "3" <CR>
   Inputs  33-48 Device # [0]                  "1" <CR>
   Inputs  49-64 Device # [0]                  "2" <CR>
```

To Log Off the 1602 Monitor and Control Unit, press return <CR> until the "Main Menu" appears and then select 11, Log Off. Once each device (1602, IPC, IEC) is assigned it's unique Remote Bus Device Number and each 1602 it's Expansion Bus Device Numbers, reconnect the RS-232 and RS-485 communication terminal blocks. (See Section 2.7 and 5.1.1 paragraph "b."). Now, go back through the Log On procedure as described above, but use the new Remote Bus Device Number you just programmmed into the 1602. If your 1602 does have Expansion Devices connected to it, select the NETWORK MENU's "Reset" option to get the Network communications started (See Table 5-1, Section 13.3).

5.5 LOGGING OFF. To log off of a 1602 MCU, type "11" <CR> at the MAIN MENU PROMPT. The 1602 will automatically log you off after 5 minutes of no keyboard activity.

5.5.1 QUICK LOG OFF/LOG ON. It is possible to leave one 1602 and go directly to another 1602. This can be accomplished in the following manner: At any menu prompt, type in "#" "$" "(Device no.)" <CR>. You will automatically be logged off the current MCU and Logged On to the MCU whose device number you just entered.
Note: AS OF THIS PRINTING, THIS PROCEDURE WILL NOT WORK WITH THE INTELLIGENT PRESSURE CONTROL or INTELLIGENT ENVIRONMENTAL CONTROL. IT WILL ONLY WORK WITH TWO OR MORE 1602 MCU'S AND THEN ONLY WHEN IN MAIN MENU.

5.6 PROGRAMMING/MONITORING PROCEDURES. The procedures for programming and monitoring the system are simple and straightforward. The Operator Programming Guide, Table 5-1, outlines the steps required to use the functions of the 1602 system. Figure 5-1 is a flow chart showing the MAIN MENU and the SUB-MENUS.

5.6.1 Initial Programming. When initially programming a new 1602 MCU, follow the sequence below for the simplest operation. Use the Operator Programming Guide, Table 5.1 for instructions.

a. Insure that the pre-operation items have been done as described in paragraph 5.1.1.

b. Log On to 1602 Monitor Control Unit #1 per the log on procedure Section 5.4.

c. Set the clock. See item 10.2 in the Operator Programming Guide.

d. Set the proper dates for Daylight Saving Time, if desired. See item 10.6 in the Programming Guide.

e. Name the 1602 MCU that you are logged on to. See item 10.7 in the Programming Guide.

f. Assign Outside Sensor its Analog input #. See item 10.11 in the Programming Guide.

g. Define Analog Inputs. See 1.6 in the Programming Guide.

h. Define Digital Inputs. See 1.7 in the Programming Guide.

i. Set Alarm set points for Analog and Digital Inputs. See 2.4 and 2.5 in the Programming Guide.

j. Set schedules. See 3.4 in the Programming Guide.

k. Define Outputs. See 4.4 in the Programming Guide.

l. Define Defrost Outputs and Schedules. See 14.4 in the Programming Guide.

m. Set Duty Cycle Program for outputs that are using it. See 6.2 in the Programming Guide.

n. Set Demand Targets. See 7.3 in the Programming Guide.

o. Set Demand Setpoints. See 7.4 in the Programming Guide.

p. Set Phase Protection. See 8.2 in the Programming Guide.

q. Leave a message? Use Mail Box. See 12.2 the Programming Guide.

r. Verify outputs and sensor readings using the List Output Status, List Analog, and List Digital selections.

s. Replace output connectors on the Field Output Board or clear Overrides, depending on how the unit was left at start up.

5.7 EXPERT MODE. The 1602 has available an 'Expert' mode which enables the operator to bypass the menu screens. The 1602 software operates normally, however, the menus are no longer displayed. From the Main Menu, you will normally choose a number depending on which function is desired. In the Expert mode, once the choice has been made, only the title of the menu you are presently in will be displayed. Once you are in a sub-menu, you again choose the appropriate number. Only a question mark (?) is displayed when you are in the Expert mode.

5.7.1 INVOKING THE EXPERT MODE. To invoke the Expert mode, type in 'X' at Main Menu prompt. To revoke the Expert mode, type in 'x' a second time at the Main Menu prompt, or Log Off.

5.7.2 GETTING HELP. If at any time, you forget which menu item you want, simply type in a '?' followed by a <CR>. The menu will be displayed as normal.

5.7.3 Figure 5-1 illustrating an Expert Mode example follows:

Figure 5-1 Expert Mode Example

```
COMPUTER PROCESS CONTROLS, INC.
     CPC-1602      REV X.XX

     (Current Name)

     Password:

CPC-1602 MAIN MENU      Mo/Da/Yr  Hr:Mn:AM
(Current Name)
-----------------------------------------
1. Inputs                8. Phase Protect
2. Alarms                9. Logging
3. Schedule             10. Sys. Info.
4. Outputs              11. Log Off
5. Override             12. Mail Box (contains mail)
6. Duty Cycle           13. Network
7. Demand               14. Defrost
? x

? 1

- INPUT MENU -
? 1

-Analog Input Present Values- ...
```

You will notice that when the Expert mode is invoked, the Menu number was entered, the title of the menu selected was displayed, and the 1602 was waiting for a number. All of the sub-menu items are no longer displayed. The Expert mode is a very efficient way of moving throughout the 1602 software to reach the information that you desire.

5.8 PROGRAMMING ENTRY. A flowchart depicting all Menu Function entries is shown in Figure 5-2. Each entry is explained in detail in Table 5-1 OPERATOR PROGRAMMING GUIDE.

Study the Flowchart and Table to learn the step-by-step basics for programming the 1602.

TABLE 5-1 OPERATOR PROGRAMMING GUIDE

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
1. INPUT MENU		
1.1 Present Analog Input Reading	"1"<CR>	Start displaying at input [1] ?
	<CR> or "1 to 64"	Display shows input #'s, sensor names, present values, today's high and lows, yesterday's high and lows, this week's high and lows, last week's high and lows, and the 16AI Board statuses.
	<CR>	INPUT MENU
1.2 List Present Digital Input Statuses	"2"<CR>	Start displaying at input [17] ?
	<CR> or "17 to 64"	Display shows digital input names, current on/off status. Accum. on time, accum. events, last on and off delay time remaining, and the 16AI Board statuses.
	<CR>	INPUT MENU
1.3 List Analog Input Definitions	"3"<CR>	Start displaying at input [1] ?
	<CR> or "1 to 64"	Display shows table identifying sensor number, name, type, engineering units, offset, gain, and logging interval. See 1.6.
	<CR>	INPUT MENU
1.4 List Digital Input Definitions	"4"<CR>	Start dispalying at input [17] ?
	<CR> or "17 to 64"	Display shows table identifying digital input number, name, event interval, on when closed or open, and On/Off delays. See 1.7
	<CR>	INPUT MENU

TABLE 5-1 OPERATOR PROGRAMMING GUIDE

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
INPUT MENU continued		
1.5 Monitor Analog Input	"5"<CR>	Sensor # ?
	<CR> or "1 to 64"	Displays the current analog sensor value once every 5 seconds.
	<CR>	Sensor # ?
	"1 to 64" or <CR>	Repeats above or INPUT MENU
1.6 Define Analog Input	"6"<CR>	Sensor # ?
(Sample Sensor #2)	"2"<CR>	Current name, correct ?
	"Y"<CR>	Name [current name] ?
	"new name"<CR>	Inp. Type (T15DL) [ ] ?
T=Temperature 1= 0-100 psig 5= 0-500 psig D= Dew Point Temperature L= Linear	"T", "1", "5", "D" or "L" <CR>	Data Log Interval Minutes (0=off) [ ] ?
	"0 to 240" <CR>	Sensor # ?
If assigned as analog.	<CR> to quit, "1-64"<CR> to continue.	INPUT MENU or Repeat above. or repeat above.
1.7 Define Digital	"7" <CR>	Input # ?
(Sample #17)	"17" <CR>	Current name, correct ?
	"Y" <CR>	Name [current name] ?
	"new name"<CR>	Event Interval (min.) [ ] ?

Note: Event interval is the time interval in which the 1602 measures for short cycle alarms on equipment. Select the number of events for alarm when setting digital alarm set points. See 2.5 below.

TABLE 5-1 OPERATOR PROGRAMMING GUIDE

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
INPUT MENU continued Should the input be considered ON when Closed or ON when Open?	"value"<CR>	ON When Closed(1), ON When Open(2)?
	"1" or "2" <CR>	Default Position, Open(0) Closed (1) [0] ?

Note: The Default Position prompt only display for those digital inputs on the 16AI boards. The purpose of the Default Position is to provide a known input state if the corresponding 16AI board powers down or fails to communicate with the 1602 MCU.

	"0 or 1"<CR>	On Delay (min.) [0]
	"value"<CR>	Off Delay (min.) [0]
	"value"<CR>	Output Number?
	<CR>	INPUT MENU
1.8 Clear Analog Input	"8"<CR>	Sensor # ?
(Example sensor 2)	"2"<CR>	Current name, correct ?
	"Y"or"N" <CR>	
Answering "N" repeats Sensor prompt.		- Cleared
		Sensor # ?
	<CR> or another sensor	INPUT MENU or repeat above
1.9 Clear Digital Input	"9"<CR>	Input # ?
If assigned as digital.	"1-64"<CR>	Current name, correct ?
Answering "N" repeats Input prompt.	"Y" or "N" <CR>	Definition(1),On Time(2), Events(3), Last On/Off Times(4).
	1, 2, 3, or 4"	
	<CR>	-cleared Definition(1),On Time(2), Events(3), Last On/Off Times(4).
May clear other items, or	<CR>	Input # ?

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
ALARM MENU	<CR> to quit or "17-64"<CR>	INPUT MENU or repeat above
1.10 Clear Hi/Lo Values	"10"<CR>	-CLEAR HI/LO VALUES- Sensor # ?
Analog sensors only. Clears all 64 Hi/Lo values.	"1 to 64"<CR> or "ALL"	Current name, correct?
Answering "N" repeats sensor # prompt.	"Y" or "N"<CR>	-cleared Sensor # ?
	<CR> to quit or	INPUT MENU or repeat above
	<CR>	MAIN MENU
2. ALARMS MENU		
2.1 List Analog Alarm Set Points	"1"<CR>	Start displaying at alarm [1] ?
	<CR> or "1 to 64"	Display shows a table that gives Input #, name, high alarm value, low alarm value, notice/alarm, and time delay.
2.2 List Digital Alarm-Notice Set Points	"2"<CR>	Start displaying at alarm [1] ?
	<CR> or "1 to 64"	Display shows a table that gives Input #, name, notice/alarm, and alarm type assigned.
Type may be: 1. Status=ON 2. Accumulated Events 3. Last ON Duration(min) 4. Accumulated ON Time(hrs.) 5. Events Per Interval 6. Last OFF Duration(min.)	<CR>	ALARM/NOTICE MENU
2.3 Reset Alarms	"3"<CR>	Alarms Reset, then ALARM/NOTICE MENU DISPLAYS

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
ALARM MENU continued		
2.4 Set Analog Alarm Set Points.	"4"<CR>	Sensor # ?
If assigned as analog.	"1 to 64"<CR>	Current name, correct ?
Answering "N" repeats sensor prompt.	"Y" or "N"<CR>	High Setpoint [ ] ?
(Sample 40 Degrees)	"40"<CR>	Low Setpoint [ ] ?
(Sample 20 Degrees)	"20"<CR>	Alarm or Notice(A/N) [ ] ?
	"A" or "N"<CR>	Delay (min.) [ ] ?
(Sample 60 minutes)	"60"<CR>	Sensor # ?
	<CR> to quit or "1-64<CR>	ALARM/NOTICE MENU or repeat

Note: Alarm causes dial out and local alarm. Notice only stores event in alarm/notice log (does not dial out).

2.5 Set Digital Alarm Set Point (If assigned as digital)	"5"<CR>	Input # ?
	"17-64"<CR>	Current name, correct ?

2.5 Set Digital Alarm Set Point Continued

Answering "N" repeats Input prompt.	"Y" or "N"<CR>	Alarm Types: 1. Status=ON 2. Accum. Events 3. Last ON Duration (min) 4. Accum. ON Time (hrs.) 5. Events Per Interval 6. Last OFF Duration (Min.)
	"1,2,3,4, or 5"<CR>	1602 asks for appropriate alarm limit.
	"type"<CR>	Alarm or Notice (A/N) [N] ?
	"A" or "N" <CR>	Input # ?

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
If not assigned as analog	To quit <CR> or "17 to 64"<CR>	ALARM/NOTICE MENU or repeat
2.6 Clear Analog Set Point	"6"<CR>	Clear Which Analog ALM/NTC ?
	"1 to 64"<CR>	Are You Sure ?
Answering "N" repeats command.	"Y" or "N"<CR>	-Cleared Clear which Analog ALM/NTC ?
to continue	To quit <CR> "1-64"<CR>	ALARM/NOTICE MENU repeats above
2.7 Clear Digital	"7"<CR>	Clear Which Digital ALM/NTC ?
	"1 to 64"<CR>	Are You Sure?
Answering "N" repeats command.	"Y" or "N"<CR>	-Cleared Clear which Digital ALM/NTC ?
to continue	To quit<CR> "1 to 64"<CR>	ALARM/NOTICE MENU repeats above
2.8 Set Local/Remote Alarms	"8"	Alarms to be sent to Local or remote device (L/R) [R]?
	"L or R"<CR> or <CR>	ALARM/NOTICE MENU
	<CR>	MAIN MENU

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
3. SCHEDULE MENU		
3.1 List One Schedule	"1"<CR>	Schedule # [ ] ?
	"1 to 12"<CR>	Current name, correct ?
Answering "N" repeats Schedule prompt.	"Y" or "N"<CR>	Display shows schedule. then, Schedule # [ ] ?
	to quit <CR>	SCHEDULE MENU or repeat
	to continue "1 to 12"<CR>	repeats above
3.2 List All Schedules	"2"<CR>	Display shows all schedules.
	<CR>	SCHEDULE MENU
3.3 List Holidays	"3"<CR>	Display shows holiday number, (1-8), Date, and Type (1-3)
	<CR>	SCHEDULE MENU
3.4 Set Schedule	"4"<CR>	Schedule # [ ] ?
	"1 to 12"<CR>	Current name, correct ?
Answering "N" cancels command.	"Y" or "N"<CR>	Name [current name] ?
Note that ( ) is not the same as [ ].	<CR> or "new name"<CR>	Event Number (next avail) ?
	"1 to 24"<CR>	Time [current] ?
(Sample 8:00AM) Note that colons are optional.	"800A"<CR> or <CR> to not change	Day [current] ?
Use first two letters of each day or H1, H2 or H3 for holidays, or MF for Monday to Friday. WK for each day of week.	"XX"<CR>	On(1) - Off(0) [ ] ?
	"1"or"0"<CR>	Event Number (next avail) ?
	<CR>	Schedule # [ ] ?

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
SCHEDULE MENU continued		
3.4 Set Schedule Continued		
	To quit <CR> to continue "1-12"<CR>	SCHEDULE MENU repeats above
3.5 Clear Schedule	"5"<CR>	Schedule # [ ] ?
	"1 to 12"<CR>	Current name, correct ? - Cleared
Answering "N" repeats schedule prompt.	"Y" or "N"<CR>	-Cleared Schedule # [ ] ?
	<CR> to quit or "1 to 12"<CR>	SCHEDULE MENU repeats above
3.6 Clear Event	"6"<CR>	Schedule # [ ] ?
	"1 to 12"<CR>	Current name, correct?
Answering "N" repeats schedule prompt.	"Y" or "N"<CR>	Clear Event Number (1-24) ?
	"1 to 24"<CR>	-Cleared Clear Event Number (1-24)
To change schedule:	<CR>	Schedule # [ ] ?
	To quit <CR> to continue "1-12"<CR>	SCHEDULE MENU repeats above
3.7 Set Holiday	"7"<CR>	Enter Date ?
	"mm/dd/yy"<CR>	Holiday Type (1-3) ?
Up to 8 holidays may be set.	"1, 2, or 3"<CR>	Enter Date ?
	<CR> to quit or "mm/dd/yy"<CR>	SCHEDULE MENU or repeat
3.8 Clear Holiday	"8"<CR>	Clear Holiday # ?
	"1 to 8"<CR>	- Cleared Clear Holiday # ?
	<CR> to quit or "1 to 8"<CR>	SCHEDULE MENU or repeat
	<CR>	MAIN MENU

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
4. OUTPUT MENU		
4.1 List One Output Definition	"1"<CR>	Output Number?
	"1 to 40"<CR>	Current name, correct?
Answering "N" repeats output prompt.	Y" or "N"<CR>	Display shows all prior programmed selections currently in memory for the output selected.
	<CR>	Output Number ?
	to quit <CR> or "1-40" to continue	OUTPUT MENU repeats above
4.2 List All Output Definitions	"2"<CR>	Start displaying at output [1] ?
	<CR> or "1 TO 40"	Display shows all prior programmed selections currently in memory for all of the defined outputs.
	<CR>	OUTPUT MENU
4.3 List Output Status	"3"<CR>	Start displaying at output [1] ?
	<CR> or "1 to 40"	Display shows present outside temperature and demand KW and the 8RO Board statuses in table form. Also shown are the various 1602 control factors that determine the output's condition. These are in a priority order from left to right.
	<CR>	OUTPUT MENU
4.4 Define Output	"4"<CR>	Output Number?
	"1 to 40"<CR>	Current name, correct ?
Answering "N" repeats output prompt.	"Y" or "N"<CR>	Name [current name] ?
	<CR>	Sensor #1 #(or [current])

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
OUTPUT MENU continued		
4.4 Define Output Continued		
	"1 to 64"<CR> or <CR> to not change	
If no sensor is used for Sensor #1, then will skip to Day Schedule.		Current name, correct ?
Answering "N" repeats Sensor # prompt	"Y" or "N"	Sensor #2 #(or [current])
NOTE: Sensors #2, #3, and #4 to be used only where average, maximum, or minimum values from multiple sensors is used for control		
	"1 to 64"<CR> or <CR> to not change.	Current name, correct ?
Answering "N" repeats Sensor # prompt.	"Y" or "N"	Sensor #3 #(or [current]) ?
	"1 to 64"<CR> or <CR> to not change.	Current name, correct ?
Answering "N" repeats Sensor # prompt.	"Y" or "N"	Sensor #4 #(or [current]) ?
	"1 to 64"<CR> or <CR> to not change.	Current name, correct ?
Answering "N" repeats Sensor # prompt.	"Y" or "N"	Avg.(A),MAX.(X) or Min. (N) [ ] ?
	"A","X", OR "N"	Cut-On [current]
	"value"<CR>	Cut-Off [current]
	"value"<CR>	On-Delay (min.) [ ] ?
	"0 to 240"<CR>	Off-Delay (min.) [ ] ?

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
OUTPUT MENU continued		
	"0 to 240"<CR>	Sensor Fail Turn (0) Off, (1) On [0] ?
Note: The Sensor Fail feature allows the output to go into a predetermined state if the input sensor fails.		
	"0" or "1"	Night Schedule # [0-12] ?
4.4 Define Output Continued		
[0] = No Night Schedule		
If a night sched. is not desired, the 1602 will skip the prompts for NSB set points and proceed to Day schedule.	"1 to 12"<CR> or <CR> for no NSB	Current name, correct?
	"Y" or "N"<CR>	NSB Cut-On [ ] ?
	"value"<CR>	NSB Cut-Off [ ] ?
	"value"<CR>	Schedule # [0-12] ?
[0] = No Schedule	"1 to 12"<CR> or <CR> if no sched. is desired.	Current name, correct ?
Answering "N" repeats schedule prompt.	"Y" or "N"<CR>	Dig. Ovrd 1 Input # [ ] ?
	"17 to 64"<CR> or <CR> for no Dig. ovrd.	Current name, correct ?
Answering "N" repeats Dig. Ovrd prompt.	"Y" or "N"<CR>	On(1) or Off(0) [ ] ?
	"1" or "0"<CR>	Dig. Ovrd 2 Input # [ ] ?
	"17 to 64"<CR> or <CR> for no Dig. ovrd.	Current name, correct ?

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
OUTPUT MENU continued		
Answering "N" repeats Dig. Ovrd. prompt.	"Y" or "N"<CR>	On(1) or Off(0) [ ] ?
	"1" or "0"<CR>	Invert Output (Y/N) [ ] ?
	"Y" or "N"<CR>	Output Number?
	<CR> to quit or "1 to 40"<CR>	OUTPUT MENU or repeat
4.5 Clear Output Definition	"5"<CR>	Output Number?
	"1 to 40"<CR>	Current name, correct ?
Answering "N" repeats output prompt.	"Y" OR N"<CR>	Clear Definition(1) or Runtime(2) ?
	"1" or "2"<CR>	-Cleared -output Number?
	<CR> to quit or "1 to 40"<CR>	OUTPUT MENU or repeat
	<CR>	MAIN MENU
5. OVERRIDE MENU		
5.1 List Overrides	"1"<CR>	Display shows override status in table form by output #, name, fixed or timed, on or off, and time remaining if timed.
	<CR>	OVERRIDE MENU
5.2 Set Overrides	"2"<CR>	Output Number?
	"1 to 40"<CR>	Current name, correct?
Answering "N" repeats output prompt.	"Y" or "N"<CR>	On=1 or Off=0 [ ] ?
	"1" or "0"<CR>	Type (Fixed=1, Timed=2) [ ] ?

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
OVERRIDE MENU continued		
If fixed is selected, time remaining prompt is skipped.	"1" or "2"<CR>	Time Remaining (min.) [ ]
	"0 to 240"<CR>	Output Number?
	<CR> to quit or "1 to 40"<CR>	OVERRIDE MENU or repeat
5.3 Clear Overrides	"3"<CR>	Output Number?
	"1 to 40"<CR>	Current name, correct?
Answering "N" repeats output prompt.	"Y" or "N"<CR>	- Cleared Output Number?
5.3 Clear Overrides Continued		
	<CR> to quit or "1 to 40"<CR>	OVERRIDE MENU or repeat
	<CR>	MAIN MENU
6. DUTY CYCLE MENU		
6.1 List Duty Cycle Set Points	"1"<CR>	Display shows in table form, output #, name, on time, off time, override Sensor no., and if override is on sensor rise or fall.
	<CR>	DUTY CYCLE MENU
6.2 Set Duty Cycle	"2"<CR>	Output Number?
	"1 to 40"<CR>	Current name, correct?
Answering "N" repeats output prompt.	"Y" or "N"<CR>	On-Time (min.) [ ] ?
	"0 to 240"<CR>	Off-Time (min.) [ ] ?
	"0 to 240"<CR>	Sensor Ovrd. (Yes=1, No=0) [ ] ?
If "N", this step is skipped.	"1" or "0"<CR>	Sensor # ?
	"1 to 64"<CR>	Current name, correct?

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
DUTY CYCLE MENU continued		
Answering "N" repeats sensor prompt.	"Y" or "N"	Ovrd. Set Point [ ] ?
	"value"<CR>	Rise or Fall
	"R" or "F"<CR>	Output Number?
	<CR> to quit or "1 to 40"<CR>	DUTY CYCLE MENU or repeat
6.3 Clear Duty Cycle Set Point	"3"<CR>	Output Number?
	"1 to 40"<CR>	Current name, correct?
6.3 Clear Duty Cycle Continued		
Answering "N" repeats output prompt.	"Y" or "N"<CR>	- Cleared Output Number?
	<CR> to quit or "1 to 40"<CR>	DUTY CYCLE MENU or repeat
	<CR>	MAIN MENU
7. DEMAND MENU		
7.1 List Demand Targets	"1"<CR>	Display shows in table form the following: Current KW, Summer Target, Winter Target, Winter / Summer Change - over Temp. Meter Multiplier and the Demand Cycle Minutes. Then display shows the Hourly and Daily Peaks and the time these occurred.
	<CR>	DEMAND MENU
7.2 List Demand Set Points	"2"<CR>	Display shows, in table form, demand set points for each output assigned, including, number, name, priority, max. shed time, min. on time, ovrd. set pt. sensor no., and ovrd. on rise or fall.

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
DEMAND MENU continued		
	<CR>	DEMAND MENU
7.3 Set Demand Targets	"3"<CR>	Summer Target (KW) [ ] ?
	"value"<CR>	Winter Target (KW) [ ] ?
	"value"<CR>	Winter/Summer Temp. (F) [ ] ?
Multiplier is Watt-Hour/Pulse from pulse generator or meter.	"value"<CR>	Multiplier [ ] ?
	"value"<CR>	Minutes in Demand Cycle [ ] ?
7.3 Set Demand Targets Continued		
	"1 to 60"<CR>	Press 'RETURN' to continue
	<CR>	DEMAND MENU
7.4 Set Demand Set Points	"4"<CR>	-SET DEMAND SETPOINTS- Output Number?
	"1 to 40CR>	Current name, correct?
Answering "N" repeats output prompt.	"Y" or "N"<CR>	Priority (1-16) [ ] ?
	"1 to 16"<CR>	Max. Shed (min.) [ ] ?
	"0 to 240"<CR>	Min. On (min.) [ ] ?
	"0 to 240"<CR>	Sensor Ovrd. (Yes=1, No=0) [ ] ?
Answering "0" skips sensor selection, temperature, and Rise/Fall. If defined as analog.	"1" or "0"<CR>	Sensor # ?
	"1 to 64"<CR>	Current name, correct?
Answering "N" repeats sensor prompt.	"Y" or "N"<CR>	Ovrd. Setpt [ ] ?
	"value"<CR>	On Rise or Fall (R/F) [ ] ?

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
DEMAND MENU continued		
	"R" or "F"<CR>	-SET DEMAND SETPOINTS- Output Number?
	<CR> to quit or "1 TO 40"<CR>	DEMAND MENU or repeat
	<CR>	MAIN MENU
8. PHASE PROTECT MENU		
8.1 List Phase Protect Outputs	"1"<CR>	Display shows a list of the outputs assigned for phase loss cut out.
	<CR>	PHASE PROTECTION MENU
8.2 Set Phase Protection	"2"<CR>	Output Number?
	"1 to 40"<CR>	Current name, correct?
Answering "N" repeats output prompt.	"Y" or "N"<CR>	-Set Output Number?
	<CR> to quit or "1 to 64"<CR>	PHASE PROTECTION MENU or, repeat
8.3 Clear Phase Protect	"3"<CR>	Output Number?
	"1 to 40"<CR>	Current name, correct?
Answering "N" repeats output # prompt.	"Y" or "N"<CR>	-Cleared Output Number?
	<CR> to quit or "1 to 40"<CR>	PHASE PROTECT MENU or repeat
	<CR>	MAIN MENU

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
9. LOGGING MENU		
9.1 Hourly Log	"1"<CR>	Display shows, in table form, for the last 16 hours, the time, KWH, KW peak and average outside temp. then asks, More [Y] ?
Answering "N" redisplays Logging Menu System will list up to 48 previous hours.	"Y" or "N"<CR>	Display shows 16 more previous hours. Then More ?
	<CR>	LOGGING MENU
9.2 Daily Log	"2"<CR>	Display shows, in table form, for the last 16 days the date, KWH, KW peak & time, Max. outside temp., and Min. outside temp., then, More [Y] ?
9.2 Daily Log Continued		
Answering "N" redisplays Logging Menu. System will list up to 48 previous days.	"Y" or "N"<CR>	Display shows 16 more previous days, then, More [Y] ?
	<CR>	LOGGING MENU
9.3 Override Log	"3"<CR>	Display shows, in table form the last 16 overrides by date, time, output no., fixed or timed, how long, and if override was to by-pass to force on or off. then, More [Y] ?
Up to 64 overrides may be displayed.	"Y" or "N"<CR>	Display shows 16 more overrides, then More [Y] ?
	<CR>	LOGGING MENU
9.4 Analog Input Log	"4"<CR>	-analog input log- Sensor # ?
If defined analog.	"1 to 64"<CR>	Current name, correct?

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
LOGGING MENU continued		
Answering "N" repeats sensor # prompt.	"Y" or "N"<CR>	Display shows, in table form, the last 16 readings of the sensor requested, and the time read, then More [Y] ?
Answering "N" re-displays Logging Menu. System will list up to 128 past readings.	"Y" or "N"<CR>	Display shows 16 more previols readings of that sensor, then More [Y] ?
	<CR>	Sensor # ?
	<CR> to quit or "1-64"	LOGGING MENU to continue
9.5 Digital Input Log	"5"<CR>	Input # ?
If not defined as analog.	"17-64"<CR>	Current name, correct ?
	"Y" or "N"<CR>	Display shows previous 9 days (midnight to midnight) Shows Accumulated On time and Accumulated Events.
	<CR>	Input Number?
	<CR> to quit or "17-64"<CR>	LOGGING MENU to continue
9.6 List Unacknowledged Alarm/ Notices.	"6"<CR>	Display lists: date, time input number, and name for 16 unacknowledged alarms/ notices, then More [Y] ?
Answering "N" redisplays Logging Menu. System will List up to 128 previous alarms/notices.	"Y" or "N"	Display lists 16 more unacknowledged alarms/ notices, then More [Y] ?
	<CR>	LOGGING MENU
9.7 List All Alarm/ Notices	7"<CR>	Display shows by date,time, input no. and name of 16 previous alarm/notices, then, More [Y] ?

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
LOGGING MENU continued		
Answering "N" redisplays Logging Menu. System will display up to 128 previous alarms/notices.	"Y" or "N"<CR>	Display shows 16 more previous alarm/notices, then More [Y] ?
	<CR>	LOGGING MENU
	<CR>	MAIN MENU
10.0 SYSTEM INFO MENU		
10.1 List All Info	"1"<CR>	Display shows all general system info as listed below: (See items 10.2 thru 10.11, also.) System Date, System Time, System Day, DST Begins, DST Ends, Device #, Phone # 1, Phone # 2, Analog Inputs Outside Sensor, and expansion Board statuses.
	<CR>	SYSTEM INFO MENU
10.2 Set Date Time	"2"<CR>	Date [mm/dd/yy] ?
(sample Dec. 25, 1987)	"12/25/76"<CR>	Time [HH:MMAM/PM] ?
(sample 4:00PM)	"400p"<CR>	DAY [xx] ?
Enter first two letters of day; i.e., Friday=FR	"FR"<CR>	SYSTEM INFO MENU
10.3 Device Number	"3"<CR>	1602 Remote Bus Device # [1] ?
	"1 to 99"<CR>	- EXPANSION BUS DEVICE -

Note:These device numbers are for the Expansion Communication Bus. The correct device numbers are suggested in the left hand column.

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
SYSTEM INFO MENU continued		
Suggested #		1602 Exp. Bus Device # [1] ?
1602 - 1	"0 to 16"<CR>	Outputs 17-24 device # [0] ?
8RO - 1	"0 to 16"<CR>	Outputs 25-32 device # [0] ?
8RO - 2	"0 to 16"<CR>	Outputs 33-40 device # [0] ?
8RO - 3	"0 to 16"<CR>	Inputs 33-48 device # [0] ?
16AI - 1	"0 to 16"<CR>	Inputs 49-64 device # [0] ?
16AI - 2	"0 to 16"<CR>	SYSTEM INFO MENU
10.4 Passwords	"4"<CR>	PW #! [current] ?
Enter anything up to five characters.	"XXXXX"<CR>	PW #2 [current} ?
	"XXXXX"<CR>	SYSTEM INFO MENU
10.5 Phone Numbers	"5"<CR>	Phone #1 [ ] ?
Up to 20 digits	"number"<CR>	Schedule # [ ] ?
Time schedule which will enable/disable Alarm Dial Out using this number.	"1 to 12"<CR>	current name, correct?
	"Y" or "N"<CR>	SYSTEM INFO MENU
	The same procedure is followed for Phone #2.	
10.6 Daylight Savings	"6"<CR>	DST Begins [mm/dd/yy] ?
	"mm/dd/yy"<CR>	DST Ends [mm/dd/yy] ?
	"mm/dd/yy"<CR>	SYSTEM INFO MENU
10.7 Unit Name	"7"<CR>	Unit Name [current] ?
Name up to 30 characters	"new name"<CR>	SYSTEM INFO MENU
10.8 Clear Memory/Logs	"8"<CR>	Clear (1)ALL Setpoints or (2)ALL Logs ?
	"1" or "2"<CR>	Are You Sure ?

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
SYSTEM INFO MENU continued		
	"Y" or "N"<CR>	Clear (1)ALL Setpoints or (2)ALL Logs ? If "1" display shows Initializing Memory....
	<CR> to quit or "1" or "2"<CR>	SYSTEM INFO or repeat.
10.9 Alm Reset Input	"9"<CR>	Digital Input # Used to Reset Alarms # [ ] ?
If not defined analog.	"17 to 64"<CR>	Current name, correct?
Answering "N" repeats Digital input prompt.	"Y" or "N"<CR>	SYSTEM INFO MENU
10-10 Outside Sensor Number	"11"<CR>	Outside Sensor Number [ ] ?
If defined analog.	"1 to 32"<CR>	SYSTEM INFO MENU
	<CR>	MAIN MENU
LOGGING OFF		
11.0 LOG OFF	"11"<CR>	Logged Off
Note: Log on to continue. See Section V Paragraph 5.4		
Back to Main Menu....		
12.0 MAIL BOX		
12.1 List Mail	"1"<CR>	Mail Box: 1 is EMPTY or By: (Name) Date: (MM/DD/YY) (Message) Box: 2 is EMPTY or By: (Name) Date: (MM/DD/YY) (Message) Box: 3 is EMPTY or By: (Name) Date: (MM/DD/YY) (Message)

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
MAIL BOX Continued		
		Box: 4 is EMPTY or By: (Name) Date: (MM/DD/YY) (Message) 1. List Mail 2. Leave Mail 3. Delete Mail
12.2 Leave Mail	"2"<CR>	ENTER MAIL Box Number
	"1"<CR>	By:
If Box contains a message it will be displayed, and a prompt to delete "Y" or "N" first.	(Name)<CR>	Contents:
	(Message)<CR>	ENTER NAIL Box Number:
	"2,3, or 4"<CR> for leaving other messages or <CR>	Repeats above for 2,3,& 4 Mail Box Menu
12.3 Delete Mail	"3"<CR>	DELETE A MAIL BOX- Box Number:
	"1"<CR>	Box 1 By (Name) Date MM/DD/YY (Message) DELETE ?
	"Y"<CR>	DELETE A MAIL BOX- Box Number:
	"2,3, or 4"<CR> to Delete other Boxes or	Repeats above for 2,3,& 4
	<CR>	Mail Box Menu
	<CR>	MAIN MENU
	"Y"<CR>	DELETE A MAIL BOX- Box Number:

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
MAIL BOX MENU continued		
	"2,3, or 4"<CR> to Delete other Boxes or	Repeats above for 2,3,& 4
	<CR>	Mail Box Menu
	<CR>	MAIN MENU
13.0 Network	"13"	Displays the NETWORK (ECN) MENU (ECN is Expansion Communication Network)
13.1 Msg. Status	"1"	Displays the txques (see note) with the corresponding Expansion Device and prompt: TXQUE numbers 0=16AI,1=16AI 2=ID CHK,3=8RO,4=8RO,5=8RO Enter the txque position [0] ?
	"0 to 5" or <CR>	Causes a continuos display of the specified txque message status, priority, destination and type.

Note - TXQUES are message ques used to send queries and data to the Expansion Devices. A changing status number between 1 and 4 indicates successful communication protocols. The frequency of the status change is 1 second for 16AI's and 1-30 seconds for 8RO's.

	Press any key	NETWORK MENU
13.2 Msg. Statuses	"2"	Displays all the Expansion Devices and the corresponding txque # and a continuos display of the specified txque message status, priority, destination and type.
	Press any key	NETWORK MENU

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
NETWORK MENU continued		
13.3 Reset ECN	"3"	ECN OFF (1) OR Reset (2) [0] ?
	"1" or	- Communication OFF -
	"2" or	- Communication Reset -
	<CR>	NETWORK MENU.
	<CR>	MAIN MENU
14.0 DEFROST MENU		
14.1 List Setpoints	"1"	Start displaying at output [1] ?
	"1 to 40"	Displays the defrost type, status, all related outputs, termination type, duration, drip time, and start times. After 2 defrost schedules display, More ? [Y]
	or	
	<CR>	Displays the next 2 defrost schedules.
	or	
	"N"	DEFROST MENU
14.2 Manual Defrost	"2"	Manual Defrost -- Output number ?
(Sample output 5)	"1 to 40" or <CR>	Output name is xxxxxx, correct? [Y]
	"N" or <CR>	Repeats, Output number ? Are You Sure? [N]

Note: If the output is already running or the output is not defined as defrost, an error and the DEFROST MENU will display.

"Y" or <CR>	Defrost started on Output # 5 - xxxxxx DEFROST MENU

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
DEFROST MENU continued		
14.3 Manual Terminate	"3"	Manual Terminate -- Output number ?
(Sample output 5)	"1 to 40" or <CR>	Output name is xxxxxx, correct? [Y]
	"N" or <CR>	Repeats, Output number?
		Are You Sure? [N]

Note: If the output is not running or the output is not defined as defrost, an error and the DEFROST MENU will display.

	"Y" or <CR>	Defrost terminated on Output #5 - xxxxxxx DEFROST MENU
14.4 Set Setpoints	"4"	- SET DEFROST SETPOINTS - Solenoid Output Number [clear] ?
(Sample output 17)	"1 to 40" or <CR>	Output name is xxxxxx, correct? [Y]

Note: To set up a defrost circuit, the Solenoid Output will need to be defined through the OUTPUT MENU (Section 4.4). If the output is not defined, an error and the DEFROST MENU will display.

	"N" or	Repeats, Solenoid Output Number [clear] ?
	<CR>	Type (1=Off Cycle, 2=Hot gas, 3=Other) [0] ?

Note: All 3 of these choices end up at the "Termination Type" prompt (explained below), so each of the Off Cycle, Hot Gas and Other types of defrost will be stepped through before the "Termination Type."

(2.Sample Hot Gas)	"2"	Heat Solenoid Output Number [clear] ?
(Sample Output 18)	"18"	Output name is xxxxxxx, correct? [Y]

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
DEFROST MENU continued		
	"N" or	Repeats, Heat Solenoid Output Number [clear] ?
	<CR>	Change Name ? [N]
(Sample "Y")	"Y" or	New Name [current] ?
	<CR>	Leaves name unchanged.
(Sample name)	"HEAT SOL" or	Saves this new name.
	<CR>	Leaves name unchanged
		Master Liquid Line solenoid Output Number [clear] ?
(Sample Output 19)	"1 to 40" or <CR>	Output name is xxxxxxx, correct? [Y]
	"N" or	Master Liquid Line solenoid Output Number [clear] ?
	<CR>	Change Name ? [N]
(Sample "Y")	"Y" or	New Name [current] ?
	<CR>	Leaves name unchanged.
(Sample name)	"MLL SOL" or	Saves this new name.
	<CR>	Leaves name unchanged
SKIPS DOWN TO "TERMINATION TYPE."		
(3.Sample Other)	"3"	Heat Solenoid Output Number [clear] ?
(Sample Output 18)	"18"	Output name is xxxxxxx, correct? [Y]
	"N" or	Repeats, Heat Solenoid Output Number [clear] ?
	<CR>	Change Name ? [N]

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
DEFROST MENU continued		
(Sample "Y")	"Y" or <CR>	New Name [current] ? Leaves name unchanged.
(Sample name)	"HEAT SOL" or <CR>	Saves this new name. Leaves name unchanged
("Termination Types")		Termination Type (0=None, 1=Sensor, 2=Switch) [0] ?

Note: Each of these choices eventually ends up at the "Duration [0] ?" prompt so each Termination Type will be stepped through before going to the "Duration" prompt.

(1. Sample 0=None)	"0"	
SKIPS DOWN TO "Duration [0] ?"		
(2. Sample 1=Sensor)	"1"	Termination Input # [0] ?
(Sample input 9)	"9"	Input name is xxxxxxxx, correct ? [Y] If the input is not an analog sensor, an error message displays and the prompt, Termination Input # [0], reappears.
	"N" or <CR>	Repeats, Termination Input # [0] ?
SKIPS DOWN TO "Duration [0] ?"		
(3. Sample 2=Switch)	"2"	Termination Input # [0] ?
(Sample input 17)	"1 to 40" or <CR>	Input name is xxxxxxxx, correct ? [Y] If the input is not a digital input, an error message displays and the prompt, Termination Input # [0], reappears.
	"N" or <CR>	Repeats, Termination Input # [0] ?

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
DEFROST MENU continued		
(Duration)		Duration [0] ?
	"0 to 240" or <CR>	Runoff [0] ? Leaves current value.
	"0 to 240" or <CR>	The current time and 6 defrost times are displayed and then the following prompt: Number of Defrost Start Time to Change ?
(Sample 2)	"1 to 6" or "ALL" or <CR>	Start Time [clear] ?
(Sample 1215A)	"1200A to 1200p" or <CR>	After entering a time, the current and 6 defrost times be displayed along with the prompt: Number of Defrost Start Time to Change ?
(Sample ALL)	"1 to 6" or "ALL" or <CR>	How many defrosts per day ?
(Sample 6)	"1 to 6" or <CR>	Start time of the first one ?
(Sample 1215A)	"1200A to 1200p" or <CR>	After entering a time, the current and 6 NEWLY CALCULATED times will appear on the screen along with the prompt: Number of Defrost Start Time to Change ?
(Sample <CR>)	"1 to 6" or "ALL" or <CR>	DEFROST MENU

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
DEFROST MENU continued		
14.5 Modify Start Times	"5"	- SET DEFROST SETPOINTS - Solenoid Output Number [clear] ?
(Sample 17)	"1 to 40" or <CR>	The current time and 6 defrost times are displayed and then the following prompt: Number of Defrost Start Time to Change ?
(Sample 2)	"1 to 6" or "ALL" or <CR>	Start Time [clear] ?
(Sample 1215A)	"1200A to 1200p" or <CR>	After entering a time, the current and 6 defrost times be displayed along with the prompt: Number of Defrost Start Time to Change ?
(Sample ALL)	"1 to 6" or "ALL" or <CR>	How many defrosts per day ?
(Sample 6)	"1 to 6" or <CR>	Start time of the first one ?
(Sample 1215A)	"1200A to 1200p" or <CR>	After entering a time, the current and 6 NEWLY CALCULATED times will appear on the screen along with the prompt: Number of Defrost Start Time to Change ?
(Sample <CR>)	"1 to 6" or "ALL" or <CR>	DEFROST MENU

TABLE 5-1 OPERATOR PROGRAMMING GUIDE continued

MENU/FUNCTION DESIRED	ENTRY FROM MENU	DISPLAY
DEFROST MENU continued		
14.6 Clear Setpoints	"6"	- CLEAR DEFROST SETPOINTS - Output number ?
(Sample output 5)	"1 to 40" or <CR>	Output name is xxxxxx, correct? [Y]
	"N" or <CR>	Repeats, Output number? Are You Sure? [N]
	"Y" or <CR>	Output #5 - xxxxxxx Cleared Output number ?
(Sample <CR>)	"1 to 40" or <CR>	DEFROST MENU
To quit	<CR>	MAIN MENU

SECTION VI

OPERATOR FUNCTION GUIDE

6.1 GENERAL. This Operator Function Guide is designed to explain the different control strategies of the 1602. Each control strategy will be described in detail and its interaction with the other control strategies will be explained. Since more than one strategy may be applied to one load, some strategies may override others. The control functions below are described in their order of priority.

6.2 PHASE LOSS. The Phase loss protection feature of the 1602 is designed to instantly turn outputs off in the event that poor incoming power is detected. In order to use the Phase loss protection feature of the 1602, it is necessary to connect a phase monitoring device (CPC Part Number 231-0258) to Input #32 (Digital). This device gives a DRY CONTACT switch closure in the event that poor incoming power is detected. The Phase Loss protection feature of the 1602 is extremely fast reacting. This reduces the chances of equipment being damaged from poor incoming power.

6.2.1 SETTING PHASE PROTECTION. From the 1602 Main Menu, choose menu item number 8; Phase Protect. To set Phase protection to a particular output, choose Submenu item number 2; Set.

6.2.2 INTERACTION WITH OTHER CONTROL SCHEMES. The Phase protection control strategy has the highest priority of any of the other control strategies of the 1602, including "Inverted" outputs. The closure on Input #32 must open before any of the loads under phase protection will return to their previous operating state using any other of the control strategies. A good application for phase protection would be setting it to an output that controls a three-phase compressor motor.

6.3 OVERRIDES. There are two types of overrides available to the operator in the 1602 control software. These types are:

1) Fixed Override
2) Timed Override

6.3.1 FIXED OVERRIDES. Fixed overrides are set from the operator terminal. These overrides can force outputs either 'ON' or 'OFF'. Once an output has been overridden, it will stay in the desired state until the override has been cancelled.

6.3.2 TIMED OVERRIDES. Timed overrides are set from the operator terminal. These overrides can also force outputs either 'ON' or 'OFF'. When a timed override is initiated, the 1602 requests that you enter the time remaining. This tells the 1602 how long you want the override to stay in effect. Level 1 password is not required to set a timed override.

SECTION VI

OPERATOR FUNCTION GUIDE

6.1 GENERAL. This Operator Function Guide is designed to explain the different control strategies of the 1602. Each control strategy will be described in detail and its interaction with the other control strategies will be explained. Since more than one strategy may be applied to one load, some strategies may override others. The control functions below are described in their order of priority.

6.2 PHASE LOSS. The Phase loss protection feature of the 1602 is designed to instantly turn outputs off in the event that poor incoming power is detected. In order to use the Phase loss protection feature of the 1602, it is necessary to connect a phase monitoring device (CPC Part Number 231-0258) to Input #32 (Digital). This device gives a DRY CONTACT switch closure in the event that poor incoming power is detected. The Phase Loss protection feature of the 1602 is extremely fast reacting. This reduces the chances of equipment being damaged from poor incoming power.

6.2.1 SETTING PHASE PROTECTION. From the 1602 Main Menu, choose menu item number 8; Phase Protect. To set Phase protection to a particular output, choose Submenu item number 2; Set.

6.2.2 INTERACTION WITH OTHER CONTROL SCHEMES. The Phase protection control strategy has the highest priority of any of the other control strategies of the 1602, including "Inverted" outputs. The closure on Input #32 must open before any of the loads under phase protection will return to their previous operating state using any other of the control strategies. A good application for phase protection would be setting it to an output that controls a three-phase compressor motor.

6.3 OVERRIDES. There are two types of overrides available to the operator in the 1602 control software. These types are:

1) Fixed Override
2) Timed Override

6.3.1 FIXED OVERRIDES. Fixed overrides are set from the operator terminal. These overrides can force outputs either 'ON' or 'OFF'. Once an output has been overridden, it will stay in the desired state until the override has been cancelled.

6.3.2 TIMED OVERRIDES. Timed overrides are set from the operator terminal. These overrides can also force outputs either 'ON' or 'OFF'. When a timed override is initiated, the 1602 requests that you enter the time remaining. This tells the 1602 how long you want the override to stay in effect. Level 1 password is not required to set a timed override.

6.3.3 INTERACTION WITH OTHER CONTROL SCHEMES. Both types of overrides have equal priority in the 1602 control software. An override cannot be removed until it has 1) Timed Out or, 2) Been removed by the operator. The only other control strategy that can "override" an override is the Phase protection. For example, if you have a compressor overridden 'ON' and also set up for phase protection, the compressor will remain on until the override has been lifted or a phase monitoring device detects poor incoming power and closes the Phase Loss input to force the compressor off.

6.4 DIGITAL INPUT OVERRIDES. Two Digital inputs can be assigned to control an output when defining the output. Digital Input Override #1 has a higher priority than Digital Input Override #2. The Digital Input Override can be either 'ON' or 'OFF'.

6.4.1 DIGITAL INPUT OVERRIDE #1. Any of the inputs 17 thru #64 which are used as Digital Inputs can be assigned as Digital Input Override #1. This Digital input will control the output it is assigned to according to the operator's instructions. You can force an output 'ON' when the Digital input changes state. Or, if you desire, you can force an output 'OFF' when the Digital input changes state.

6.4.2 DIGITAL INPUT OVERRIDE #2. Any of the inputs #17 thru #64 which are used as Digital Inputs may be assigned as Digital Input Override #2. This override works the in the same manner as Digital Input Override #1. The only difference is that Digital Input Override #1 takes priority over Digital Input Override #2.

6.4.3 INTERACTION WITH OTHER CONTROL SCHEMES. Phase protection and Overrides are the only two other control features that have priority over the Digital Input Overrides. The Digital Input Overrides are defined when you define a particular output. When you are programming the 1602, and defining the output, the software will ask you what Digital Input Override you desire. An example of using both Digital Input Overrides is control of a stage of store cooling. Ordinarily, cooling will run under temperature control. If you assigned Digital Input Override #1 to be from an air pressure switch at the fan to turn the output off, and Digital Input Override #2 to be from a Dewpoint control to turn the output on, then you could be assured that the cooling would not run with the fan off, and that during high humidity, cooling would be used to dehumidify.

6.5 SCHEDULES. The 1602 has the capacity for up to 12 different schedules. This enables the operator to control an output at specific times of the day, on specific days if desired. Each individual schedule can have up to 24 events. An 'ON' or 'OFF' action is called an event. For example, 'ON' at 11:30 p.m. on Tuesday 'TU' is an event; 'ON' at 8:00 a.m. on each day of the week 'WK' is one event; 'OFF' at 8:30 a.m. on Friday is another event; 'OFF' at 12:00 a.m. on a holiday 'H1" is another event. Use 'WK' to program every day Sunday thru Saturday, and 'MF' for

Monday thru Friday, and H1, H2, or H3 for holidays. Refer to the Operator Programming Guide, item 3.4 for details in programming. When you are programming the 1602, you may define one schedule per output. However, if you are programming an output under analog sensor control, you may enter a schedule for Night Setback which will indicate when to raise or lower your analog setpoints if desired. Each schedule can perform three different functions. It can turn a load 'ON' or 'OFF' at a specific time, initiate Night Setback analog setpoints at a specific time, and control which of the two telephone numbers to dial out in the event of an alarm.

6.5.1 INTERACTION WITH OTHER CONTROL SCHEMES. The Schedule feature of the 1602 has priority over Demand limiting, Duty cycling, and Analog sensor control. If a load is scheduled 'OFF', then it cannot be controlled under any of those strategies. For example, if an output is under schedule and sensor control, if the schedule is off, then the sensor no longer controls the output. However, as long as the load is scheduled 'ON', then Demand limiting, Duty cycling, and Analog sensor control will function normally if the output has been programmed to use one of these control strategies. An example of this would be a Meat Preparation area where you want temperature control during the day, but want to shut the area down at night. Note that a schedule does not have priority over Phase loss protection, Overrides, or Digital Input overrides. If one or more of these occurs, they override the schedule function.

6.6 DEMAND LIMITING. Demand Limiting enables the operator to set an energy demand target and use the 1602 to try to achieve it. With the Demand control strategy, it is possible for the operator to assign priority for the outputs that he wishes to shed when the demand target is exceeded. Also, all outputs set for demand can have an analog sensor setpoint to cancel the demand shed if the setpoint is exceeded. The Demand limiting feature of the 1602 is extensive. The features include; Summer targets; Winter targets; a Winter/Summer temperature which tells the 1602 when to switch from winter targets to summer targets; priority of which output is shed first and which is shed last; maximum shed time; minimum on time; sensor override; and override on rise or fall of the analog setpoint. The Operator enters a Summer Demand target, and a Winter Demand target. All outputs can be given the same priority if desired. When the Demand target is exceeded, the 1602 begins to shed outputs starting with all outputs assigned as priority one. If after a minute, the demand does not fall below the target, all outputs assigned priority two will shed. This continues through priority 16 if the demand remains above the target. Each output is given a minimum ON time and a maximum OFF time by the operator. If an output is shed and the demand falls below target, the output will be turned on again and remain on for the specified ON time. However, if the maximum OFF time is exceeded without the demand falling below target, the 1602 will bring the load back on again. The operator may also enter an analog

sensor override setpoint and an override on rise or fall of setpoint. To arrive at the Winter and Summer Targets refer to Technical Instructions Bulletin #250-6000 for calculating the watt-hour per pulse multiplier which is required in Menu item 7.3 "Set Demand Targets". For installations using a KW meter with built-in pulse contacts, the watt-hour per pulse multiplier is obtainable from the meter data or from the electric utility company. A good rule of thumb for Demand Target is 80% of expected Summer high and 70% of expected Winter high for Summer and Winter Targets respectively.

6.6.1. INTERACTION WITH OTHER CONTROL SCHEMES. Demand limiting is lower in priority than Phase loss protection, Overrides, and Digital Input overrides. If any of these occur, the load will not demand limit. Note that if under schedule control, the load must be scheduled 'ON' in order to demand shed an output. If the output is scheduled 'OFF' then even if the analog sensor override setpoint is exceeded, the load will remain off. Demand limiting does have priority over Duty Cycling and Analog sensor control. For example, if you have set an analog sensor override setpoint that is higher than your normal analog sensor setpoint, if the sensor is calling for the load to be 'ON' but the demand limiting is calling for the load to be 'OFF', the load will remain off as long as the analog sensor override setpoint is not exceeded. When the maximum shed time has expired, the output will return to the analog sensor setpoints. A load that is 'OFF' from Demand limiting cannot Duty cycle, or control from an analog sensor. Demand limiting must have a load 'ON' before Duty cycling or Analog sensor control will operate.

6.6.2 DEMAND CYCLE. Loads will be shed to try to maintain the average KW at or below the Target as set by the user. The average KW is a running average during the just past Demand Cycle period. This period, "Demand Cycle", may be programmed by the user to match the power companies Demand Cycle Period of 15 min. or 30 min. or as desired.

6.7 DUTY CYCLING. Duty Cycling enables the operator to reduce energy consumption by cycling loads on and off for specified time intervals. The Duty Cycling features include; Specified On time, specified Off time, analog sensor override setpoint, and override on Rise or Fall of analog setpoint. The On time tells the 1602 how long to cycle the output under Duty cycling control on, the Off time tells the 1602 how long to cycle the output off, the Analog sensor override tells the 1602 to bring the load back on if the temperature rises above the setpoint or falls below the setpoint.

6.7.1 INTERACTION WITH OTHER CONTROL SCHEMES. Duty Cycling has a lower priority than Phase loss protection, Overrides, Digital Input overrides, Scheduling, and Demand limiting. If any of these occur, the load will not Duty cycle. Note that if under schedule control, the load must be scheduled 'ON' in order to Duty cycle. Duty cycling does have priority over analog sensor control. If the load has been set to Duty cycle off, and the

normal analog sensor setpoints have been exceeded, then the load will remain off unless the analog sensor setpoint specified in the Duty cycling menu has been exceeded.

6.8 ANALOG SENSOR CONTROL. Analog Sensor control is probably the most frequently used of all the 1602's control strategies. It enables the user to control any of the 40 outputs by temperature, pressure, a linear signal, or humidity levels. When used in conjunction with a Night Setback schedule, the analog sensor control strategy enables the user to have total control of the environment that the 1602 is monitoring. When in analog sensor control, the operator may specify a cut-on value, a cut-off value, and and on-time delay, an off-time delay. Up to four analog inputs may be assigned to one output to control based on one of three values: (1.) Average, (2.) Maximum, or (3.) Minimum.

6.8.1 INTERACTION WITH OTHER CONTROL SCHEMES. The Analog sensor(s) control strategy has the lowest priority of any of the other 1602 control functions. Phase Loss, Overrides, Digital Input overrides, Schedules, Demand Limiting, and Duty Cycling can override a load under analog sensor(s) control. In the case of schedules, demand limiting and duty cycling, the load must be "on" before the analog sensor control strategy will operate. Unless these conditions are satisfied, the sensor can not control an output.

6.9 DEFROST SCHEDULES. The defrost capabilities are extensive in that they can provide the standard hot gas, electric heat, or off cycle types and up to up to 6 defrost schedules per day. The programmable features include the refrigeration circit output number(liquid line solenoid valve, suction stop valve, etc.), defrost type (hot gas, electric, off cycle), defrost output number(hot gas solenoid valve, electric defrost contactor, etc.), master liquid line solenoid output number, termination type/number (none, sensor, digital input), defrost duration, runoff time, and up to 6 defrost times.

6.9.1 INTERRACTION WITH OTHER CONTROL SCHEMES. When in the idle state (no defrost in progress), the defrost outputs operate as normal outputs controlled by any of the other operator functions as discussed in this Section VI. When a defrost is in process, the outputs being controlled by the defrost strategy can not be changed by any other control scheme except in two situations. The digital override #1 and #2 can be programmed to override the defrost strategy. All other functions are overriden by the defrost program. Within the defrost strategy it is, ofcourse, possible to terminate a defrost manually.

6.10 INVERTED OUTPUTS. When an output is programmed to be an inverted output, it will be On when its assigned input(s) set points are Off and vice versa. The use of this feature is important where it is desired to have loads fail off during any power failure to the 1602 Monitor Control Unit. An example is air conditioning loads. By wiring the control circuit to the normally open (N.O.) contacts on the control relay, any power lost to the

1602 will cause the load to fail off. The load will be On (24volts to the control relay coil) when it is programmed to be Off, since it is inverted. When programmed to be On the load is actually Off. NOTE: Unlike the 1602 outputs which provide the 24 VAC source, the 8RO Expansion Board(s) in an Expansion Enclosure may optionally provide the 24 VAC source or use an external power source (See the "Optional Parts List", Section 9.3).

6.10.1 INTERACTION WITH OTHER CONTROL SCHEMES. Inverted outputs react just the opposite of non-inverted outputs with respect to all other control demand functions except for Phase Loss Protection. Phase Loss Protection has priority and will always turn the load Off in the event of a phase loss even if the load is inverted.

6.11 LOGGING. The Logging Menu has functions for both hourly and daily logs. Overrides, analog inputs, digital inputs, and alarms/notices both acknowledged and unacknowledged are maintained in the logs.

6.11.1 HOURLY LOG. This displays in table form, for the last 48 hours, the time, KWHRs, KW peak and average outside temperature.

6.11.2 DAILY LOG. This displays in table form, for the last 48 days, the date, KWHRs, KW peak and time, Maximum outside temperature, and minimum outside temperature.

6.11.3 OVERRIDE LOG. This displays in table form the last 64 overrides showing date, time, output no., fixed or timed, how long, and if override was to bypass On or Off.

6.11.4 ANALOG INPUT LOG. This displays in table form the last 128 readings of the sensor requested.

6.11.5 DIGITAL INPUT LOG. Displays the previous 9 days (midnight to midnight) showing Accumulated On Time and Accumulated Events.

6.11.6 UNACKNOWLEDGED ALARMS/NOTICES. This function will allow for one to view, in table form, up to 128 previous unacknowledged alarms and notices. Display shows by date, time, input no. and name.

6.11.7 ALL ALARMS/NOTICES. All alarms and notices, both acknowledged and unacknowledged, are displayed in table form by date, time, input no., and name for the previous Alarms/Notices. Up to 128 can be logged. See the

SECTION VII

TROUBLESHOOTING

7.1 GENERAL. The 1602 is designed to operate without the need for constant maintenance or adjustments. This troubleshooting guide is provided in the event that a problem develops with your 1602.

TABLE 7-1 TROUBLESHOOTING GUIDE

SYMPTOM	POSSIBLE CAUSE
No lights on 1602 when first powered-up.	Check for 120 VAC input power on power terminals "H" and "N". Check On/Off circuit breaker switch. Check Power Supply Board. Circuit breaker, transformers, and other power related components are accessible by removing the main chassis to reach the back.
Yellow 'Running' light does not blink.	Check card cage to make sure that all cards are seated properly. Check all interconnecting cables on 1602 to insure that they are plugged in firmly.
Unit does not Communicate	Check Operator terminal connections to 1602. Check Modem connections to 1602. Check jumpers between terminals #206 & 208. Also between #212-#213, & #214-215 Check to see that Baud rate is set to same rate on terminal or modem. Note: The 1602 must be turned off and back on again after changing baud select switches. Be sure that no two devices have the same device number. Check all cards and cables to insure that they are seated.
No 24 VAC output when load is 'OFF'.	Check pico fuse to make sure it is not blown. Check that output is not overriden 'ON' from terminal.

TABLE 7-1 TROUBLESHOOTING GUIDE continued

SYMPTOM	POSSIBLE CAUSE
Continued- No 24 VAC when load is 'OFF'.	Remember that the 1602 sends out 0.0 VAC to turn a load 'ON' and 24.0 VAC to turn a load 'OFF'. If an output is inverted, just the reverse occurs.
Unit will not dial out on Alarms.	Check modem switch settings. Check connecting wire between modem and 1602. Check to see that you have a 'live' phone line. Check that valid phone numbers have been entered into 1602. Check to insure that a schedule has been programmed into 1602 for dial out alarms.
KW & KWH readings are not correct.	Check to see if the KW meter has a pulse. If Current Transformers and Watt-Hour Transducer are used, check C.T.polarization and phase rotation to be sure these are correct. Refer to Technical Bulletin No. 250-6000 for additional information.

The 1602 has been designed for ease of operation. However, it is possible to use some complex controlling strategies when maintaining the environment in your building. Several problems can be eliminated by checking all the field wiring BEFORE turning the power on for the first time. Also, on initial power up, disconnect all outputs by pulling off the four terminal blocks on the output board and the Expansion Bus terminal block on the Field Inputs Board. This will insure that all loads will remain 'ON' or in their fail safe state when the 1602 is turned on for the first time. When programming the 1602, please take the time to fill out the programming forms in section VIII. These forms will help you to understand how you want to control your building environment, help eliminate any programming 'bugs' that you may encounterm, and provide a written backup of all your setpoints.

The following alarms (Tables 7-2, 7-3) may occasionally appear in the Unacknowledged and Acknowledged Alarm Logs. These Logs can be displayed through the 1602's LOGGING MENU (see Table 5-1, Sections 9.6 and 9.7).

TABLE 7-2 SYSTEM ALARMS/NOTICES

ERROR	ALARM/NOTICE	POSSIBLE CAUSE/SOLUTION
Setpoints Memory Error	A	This means there has been an error in the battery backed memory. Re-load the setpoints with the Orion Data Pak Software or check ALL the setpoints to be sure they are correct. The memory is checked only when the 1602 MCU's power is turned on. If this error persists after turning the 1602's power off/on several times, replace the processor card.
Logging Memory Error 0 Logging Memory Error 1	N	This means there has been an error in the battery backed I/O Memory. Display all the logs to determine if any of them are corrupt. Analog inputs logs 33-64 are stored on the 2nd I/O Memory Card. All other logs are on the 1st Card. The I/O memory is checked only when the 1602 MCU's power is turned on. If this error persists after turning the 1602's power off/on several times, replace the I/O memory card.
Phase Fail	N	No action
Phase Restore	N	No action
Power Fail	N	No action
Power Restore	N	No action
Sensor Shorted	A	Anaolg input sensor is shorted. Check the wiring and sensor specified by the alarm.

TABLE 7-2 SYSTEM ALARMS/NOTICES continued

ERROR	ALARM/NOTICE	POSSIBLE CAUSE/SOLUTION
Sensor Open	A	Anaolg input sensor has gone to the open state. Check the wiring and sensor specified by the alarm.

Note: If the OPEN sensor input is on a 16AI board, check to see if the board is ONLINE. Analog inputs go to the OPEN state if the 16AI board fails to communicate. If the 16AI Expansion Board is OFFLINE, check the Unacknowledged Alarms Log and use Table 7-3 to determine the cause/solution.

Most of the Network Alarms/Notices listed below tend to be "self correcting" and therefore require no service at all. If an Expansion Board (16AI or 8RO) is powered down, disconnected from the Expansion Bus, or goes OFFLINE for any reason, the 1602 MCU will check the board once a minute until the board comes back ONLINE, or the Expansion Board Device Number in the SYSTEM INFO MENU is removed (assigned a 0, See Table 5-1, Section 10.3). If "No Expansion Devices" are on the Expansion Communication Bus and the Network is ON, the 1602 MCU will try once every 5 minutes to get the communications restarted.

TABLE 7-3 NETWORK ALARMS/NOTICES

ERROR	ALARM/NOTICE	POSSIBLE CAUSE/SOLUTION
No Expansion Devices	A	This error means the communication has stopped due to either a hardware or programming problem. The alarm should be followed within 7-8 minutes by 1 or more "Node ONLINE..." notices unless there are no Expansion Devices. If no "Node ONLINE..." notices appear, check Expansion Bus wiring, 1602 and Expansion Board switch settings, and 1602 and Expansion Board Device numbers set in the SYSTEM INFO MENU. Also try resetting the Expansion Communication Network through the NETWORK MENU.

TABLE 7-3 NETWORK ALARMS/NOTICES continued

ERROR	ALARM/NOTICE	POSSIBLE CAUSE/SOLUTION
Node OFFLINE	A	The specified Expansion Device has just stopped communicating for any number of reasons. This alarm should be followed by a "Node ONLINE..." notice within 2-3 minutes. If no notice appears, check the hardware and software as described in the alarm above.
Node ONLINE	N	The specified Expansion Device has just restarted communicating. No action is needed.
No Response - Node OFFLINE	A	All 3 of these alarms are self correcting and should be followed by a "Node ONLINE..." notice within 2-3 minutes. If the specified Expansion Board does not come back ONLINE, check the hardware and software as specified in the "No Expansion Devices" alarm above.
Bad Msg. - Node OFFLINE	A	
Bad CKSum - Node OFFLINE	A	

If you do run into a problem that is not mentioned in this manual, please feel free to call the Customer Service Department at CPC at (404) 425-2724.

SECTION VIII

PROGRAMMING FORMS

8.1 GENERAL. The 1602 is designed for ease of use. However, it is possible to use very complex controlling strategies to maintain your building environment. These programming forms are provided to enable the operator to decide how the environment is to be controlled before actual programming. If the programming forms are filled out before start up of the 1602, the initial programming can be accomplished easily and efficiently. The programming forms are designed so that they are filled out in the order that the 1602 is programmed. The first few weeks of 1602 operation will undoubtably require several programming "adjustments" so go back and update these programming forms when the system seems properly "tuned" to its environment.

1602 OUTPUT SUMMARY

JOB NAME: _____ DATE: _____

MCU #: _____ PREPARED BY: _____

LOCATION: _____

OUTPUT NO.	DESCRIPTIONS	CONTROL FUNCTIONS										
		PHASE LOSS	DIGITAL OVERRIDE	SCHEDULE	DEMAND LIMITING	DUTY CYCLE	SENSOR #1	SENSOR #2	SENSOR #3	SENSOR #4	NIGHT SET BACK	INVERTED YES/NO
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												

CPC1602OUTPUT111088

1602 INPUT DEFINITIONS

JOB NAME: _____ DATE: _____

MCU #_____ PREPARED BY: _____

LOCATION: _____

#	DESCRIPTION	ANA. or DIGITAL	NAME (10 CHAR.)	TYPE *	EU **	OFFSET	GAIN	LOG INTERVAL/ EVENT INTERVAL
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								

CPC1602INPUT111088-32

NOTES: * TYPES INCLUDE: T = TEMPERATURE SENSOR
1 = 0-100 PSI PRESSURE TRANSDUCER
5 = 0-500 PSI PRESSURE TRANSDUCER
D = DEW POINT SENSOR
L = LINEAR TRANSDUCER -1 TO +7VDC

** EU = ENGINEERING UNITS WHICH ARE DEFINED AUTOMATICALLY WHEN SELECTING T,1,5, OR D FOR SENSOR TYPE. USER DEFINES UP TO TWO CHARACTERS WHEN SELECTING L FOR SENSOR TYPE.

EVENT INTERVAL IS FOR DIGITAL ONLY AND MAY BE 0 TO 32,000 MINUTES.

NOTE: * DAY TYPES AVAILABLE: MF = MON-FRI; MO = MONDAY; TU = TUESDAY;
WE = WEDNESDAY; TH = THURSDAY; FR = FRIDAY;
SA = SATURDAY; SU = SUNDAY; WK = SUN-SAT

1602 INPUT DEFINITIONS

JOB NAME: _____ DATE: _____

CU #_____ PREPARED BY: _____

LOCATION: _____

#	DESCRIPTION	ANA. or DIGITAL	NAME (10 CHAR.)	TYPE *	EU **	OFFSET	GAIN	LOG INTERVAL/ EVENT INTERVAL
33								
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								
49								
50								
51								
52								
53								
54								
55								
56								
57								
58								
59								
60								
61								
62								
63								
64								

CPC1602INPUT111088-64

NOTES: * TYPES INCLUDE: T = TEMPERATURE SENSOR
1 = 0-100 PSI PRESSURE TRANSDUCER
5 = 0-500 PSI PRESSURE TRANSDUCER
D = DEW POINT SENSOR
L = LINEAR TRANSDUCER -1 TO +7VDC

** EU = ENGINEERING UNITS WHICH ARE DEFINED AUTOMATICALLY WHEN SELECTING T,1,5, OR D FOR SENSOR TYPE. USER DEFINES UP TO TWO CHARACTERS WHEN SELECTING L FOR SENSOR TYPE.

EVENT INTERVAL IS FOR DIGITAL ONLY AND MAY BE 0 TO 32,000 MINUTES.

NOTE: * DAY TYPES AVAILABLE: MF = MON-FRI; MO = MONDAY; TU = TUESDAY;
WE = WEDNESDAY; TH = THURSDAY; FR = FRIDAY;
SA = SATURDAY; SU = SUNDAY; WK = SUN-SAT

1602 ANALOG ALARM SET POINTS

JOB NAME: _____
MCU # _____
LOCATION _____

DATE: _____
PREPARED BY: _____

ALARM #	DESCRIPTION	SENSOR #	HIGH LIMIT	LOW LIMIT	ALARM/NOTICE	TIME DELAY
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						

1602ANALOGALARM111088-32

1602 ANALOG ALARM SET POINTS

JOB NAME: _____ DATE: _____

1CU # _____ PREPARED BY: _____

LOCATION _____

ALARM #	DESCRIPTION	SENSOR #	HIGH LIMIT	LOW LIMIT	ALARM/NOTICE	TIME DELAY
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						
48						
49						
50						
51						
52						
53						
54						
55						
56						
57						
58						
59						
60						
61						
62						
63						
64						

1602ANALOGALARM111088-64

1602 DIGITAL ALARMS/NOTICES

JOB NAME:_____ DATE:_____

'CU #_____ PREPARED BY:_____

LOCATION:_____

NO.	DESCRIPTION	INPUT	* TYPE	LIMITS (ONLY ONE PER LINE)				
				EVENTS	ON TIME	HOURS CLOSURE	EVENTS/ INTERVL	OFF TIME
33								
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								
49								
50								
51								
52								
53								
54								
55								
56								
57								
58								
59								
60								
61								
62								
63								
64								

1602DIGIALM111088-64

NOTES: * DIGITAL ALARM TYPES:
1. ON CLOSURE
2. TOTAL EVENTS
3. CONTINUOUS ON TIME
4. HOURS OF CLOSURE
5. EVENTS/INTERVAL
6. CONTINUOUS OFF TIME

1602 SCHEDULES

JOB NAME: _____ DATE: _____

MCU #_____ PREPARED BY: _____

LOCATION: _____

SCHEDULE #_____

LOCATION: _____

EVENT NO.	TIME	DAY(S) *	ON/OFF
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			

SCHEDULE #_____

LOCATION: _____

EVENT NO.	TIME	DAY(S) *	ON/OFF
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			

1602SCHEDULE111088

NOTE: * DAY TYPES AVAILABLE: MF = MON THRU FRI; WK = SUN THRU SAT;
MO = MONDAY; TU = TUESDAY;
WE = WEDNESDAY; TH = THURSDAY;
FR = FRIDAY; SA = SATURDAY;
SU = SUNDAY; H1 = HOLIDAY 1;
H2 = HOLIDAY 2; H3 = HOLIDAY 3.

1602 OUTPUT DEFINITIONS (SET POINTS)

JOB NAME: _____ DATE: _____

CY #: _____ PREPARED BY: _____

LOCATION: _____

OUTOUT NO.	DESCRIPTION	SENSOR NO. 1	2	3	4	CUT ON	CUT OFF	ON DELAY	OFF DELAY	NITE SCH	NIGHT CUT ON	NIGHT CUT OFF	ON/OFF SCHEDULE	DIGITAL OVRD. 1	DIGITAL OVRD. 2	INVERTED YES/NO	NOTES
1	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
2	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
3	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
4	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
5	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
6	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
7	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
8	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
9	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
10	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
11	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
12	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
13	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
14	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
15	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
16	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
17	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
18	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
19	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
20	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
21	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
22	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
23	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
24	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
25	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
26	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
27	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
28	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
29	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
30	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
31	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
32	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
33	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
34	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
35	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
36	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
37	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
38	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____
40	_____	_	_	_	_	___	___	___	___	___	___	___	___	___	___	___	_____

1602OUTPUTSETPOINTS111088

1602 DUTY CYCLE SET POINTS

OUTPUT NO.	DESCRIPTION	ON TIME	OFF TIME	SENSOR OVRRD				OVERRIDE SET POINT	RISE OR FALL
				1	2	3	4		
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

CPC1602DUTYCYCLE111088

DEMAND LIMITING TARGETS

SUMMER TARGET	WINTER TARGET	WINTER/ SUMMER TEMP.	METER MULTIPLIER	MINUTES IN DEMAND CYCLE	NOTES

DEMAND LOAD SET POINTS

LOAD NO.	DESCRIPTION	PRIORITY	MAX. SHED MIN.	MIN. ON MIN.	SENSOR OVERRIDE				OVERRIDE SET POINT	RISE OR FALL
					#1	#2	#3	#4		
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										

CPC1602DEMAND111088

1602 PHASE LOSS		
OUTPUT NO.	DESCRIPTION	SET YES/NO
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		
32		
33		
34		
35		
36		
37		
38		
39		
40		

CPC1602PHLOSS111088

1602 DEFROST SUMMARY AND SETPOINTS SHEET___OF___

JOB NAME: _____ DATE: _____
MCU# _____ PREPARED BY: _____
LOCATION: _____ SHEET___OF___

OUTPUT NO. *	DESCRIPTION	TYPE DEFROST	DEFROST START TIMES:	LENGTH OF DEFROST	LENGTH OF RUN OFF	TERM-INAT-ION	DIGITAL OV'RIDE #1 #2
_____	L.L.S_____ SUCTION STOP_____ OTHER_____ FOR: _____ _____ _____	___H.G. ___ELE. ___OFF CYC. ___AIR	1ST__:___M 2ND__:___M 3RD__:___M 4TH__:___M 5TH__:___M 6TH__:___M	FAIL SAFE TIME: ___MIN.	TIME: ___MIN.	ANALOG SENSOR NO.___ SETPOINT ___DEG.F DIGITAL: _____	___ ___
_____	L.L.S_____ SUCTION STOP_____ OTHER_____ FOR: _____ _____ _____	___H.G. ___ELE. ___OFF CYC. ___AIR	1ST__:___M 2ND__:___M 3RD__:___M 4TH__:___M 5TH__:___M 6TH__:___M	FAIL SAFE TIME: ___MIN.	TIME: ___MIN.	ANALOG SENSOR NO.___ SETPOINT ___DEG.F DIGITAL: _____	___ ___
_____	L.L.S_____ SUCTION STOP_____ OTHER_____ FOR: _____ _____ _____	___H.G. ___ELE. ___OFF CYC. ___AIR	1ST__:___M 2ND__:___M 3RD__:___M 4TH__:___M 5TH__:___M 6TH__:___M	FAIL SAFE TIME: ___MIN.	TIME: ___MIN.	ANALOG SENSOR NO.___ SETPOINT ___DEG.F DIGITAL: _____	___ ___
_____	L.L.S_____ SUCTION STOP_____ OTHER_____ FOR: _____ _____ _____	___H.G. ___ELE. ___OFF CYC. ___AIR	1ST__:___M 2ND__:___M 3RD__:___M 4TH__:___M 5TH__:___M 6TH__:___M	FAIL SAFE TIME: ___MIN.	TIME: ___MIN.	ANALOG SENSOR NO.___ SETPOINT ___DEG.F DIGITAL: _____	___ ___
_____	L.L.S_____ SUCTION STOP_____ OTHER_____ FOR: _____ _____ _____	___H.G. ___ELE. ___OFF CYC. ___AIR	1ST__:___M 2ND__:___M 3RD__:___M 4TH__:___M 5TH__:___M 6TH__:___M	FAIL SAFE TIME: ___MIN.	TIME: ___MIN.	ANALOG SENSOR NO.___ SETPOINT ___DEG.F DIGITAL: _____	___ ___

CPC1602DEFROST111088-1

* DEFROST OUTPUTS MAY BE UP TO 40 PER MCU. USE AS MANY FORMS AS REQUIRED.

1602 DEFROST SUMMARY AND SETPOINTS SHEET___OF___

JOB NAME:_____
MCU#_____
LOCATION:_____

DATE:_____
PREPARED BY:_____
SHEET___OF___

OUTPUT NO. *	DESCRIPTION	TYPE DEFROST	DEFROST START TIMES:	LENGTH OF DEFROST	LENGTH OF RUN OFF	TERM-INAT-ION	DIGITAL OV'RIDE #1 #2
_____	L.L.S_____ SUCTION STOP_____ OTHER_____ FOR:_____ _____ _____	___H.G. ___ELE. ___OFF CYC. ___AIR	1ST__:___M 2ND__:___M 3RD__:___M 4TH__:___M 5TH__:___M 6TH__:___M	FAIL SAFE TIME: ___MIN.	TIME: ___MIN.	ANALOG SENSOR NO.___ SETPOINT ___DEG.F DIGITAL: _____	___ ___
_____	L.L.S_____ SUCTION STOP_____ OTHER_____ FOR:_____ _____ _____	___H.G. ___ELE. ___OFF CYC. ___AIR	1ST__:___M 2ND__:___M 3RD__:___M 4TH__:___M 5TH__:___M 6TH__:___M	FAIL SAFE TIME: ___MIN.	TIME: ___MIN.	ANALOG SENSOR NO.___ SETPOINT ___DEG.F DIGITAL: _____	___ ___
_____	L.L.S_____ SUCTION STOP_____ OTHER_____ FOR:_____ _____ _____	___H.G. ___ELE. ___OFF CYC. ___AIR	1ST__:___M 2ND__:___M 3RD__:___M 4TH__:___M 5TH__:___M 6TH__:___M	FAIL SAFE TIME: ___MIN.	TIME: ___MIN.	ANALOG SENSOR NO.___ SETPOINT ___DEG.F DIGITAL: _____	___ ___
_____	L.L.S_____ SUCTION STOP_____ OTHER_____ FOR:_____ _____ _____	___H.G. ___ELE. ___OFF CYC. ___AIR	1ST__:___M 2ND__:___M 3RD__:___M 4TH__:___M 5TH__:___M 6TH__:___M	FAIL SAFE TIME: ___MIN.	TIME: ___MIN.	ANALOG SENSOR NO.___ SETPOINT ___DEG.F DIGITAL: _____	___ ___
_____	L.L.S_____ SUCTION STOP_____ OTHER_____ FOR:_____ _____ _____	___H.G. ___ELE. ___OFF CYC. ___AIR	1ST__:___M 2ND__:___M 3RD__:___M 4TH__:___M 5TH__:___M 6TH__:___M	FAIL SAFE TIME: ___MIN.	TIME: ___MIN.	ANALOG SENSOR NO.___ SETPOINT ___DEG.F DIGITAL: _____	___ ___

CPC1602DEFROST111088-2

* DEFROST OUTPUTS MAY BE UP TO 40 PER MCU. USE AS MANY FORMS AS REQUIRED.

1602 DEFROST SUMMARY AND SETPOINTS SHEET___OF___

JB NAME:_____
CU#_____
LOCATION:_____

DATE:_____
PREPARED BY:_____
SHEET___OF___

OUTPUT NO. *	DESCRIPTION	TYPE DEFROST	DEFROST START TIMES:	LENGTH OF DEFROST	LENGTH OF RUN OFF	TERM-INAT-ION	DIGITAL OV'RIDE #1 #2
_____	L.L.S_____ SUCTION STOP_____ OTHER_____ FOR:_____ _____ _____	___H.G. ___ELE. ___OFF CYC. ___AIR	1ST__:___M 2ND__:___M 3RD__:___M 4TH__:___M 5TH__:___M 6TH__:___M	FAIL SAFE TIME: ___MIN.	TIME: ___MIN.	ANALOG SENSOR NO.___ SETPOINT ___DEG.F DIGITAL: _____	___ ___
_____	L.L.S_____ SUCTION STOP_____ OTHER_____ FOR:_____ _____ _____	___H.G. ___ELE. ___OFF CYC. ___AIR	1ST__:___M 2ND__:___M 3RD__:___M 4TH__:___M 5TH__:___M 6TH__:___M	FAIL SAFE TIME: ___MIN.	TIME: ___MIN.	ANALOG SENSOR NO.___ SETPOINT ___DEG.F DIGITAL: _____	___ ___
_____	L.L.S_____ SUCTION STOP_____ OTHER_____ FOR:_____ _____ _____	___H.G. ___ELE. ___OFF CYC. ___AIR	1ST__:___M 2ND__:___M 3RD__:___M 4TH__:___M 5TH__:___M 6TH__:___M	FAIL SAFE TIME: ___MIN.	TIME: ___MIN.	ANALOG SENSOR NO.___ SETPOINT ___DEG.F DIGITAL: _____	___ ___
_____	L.L.S_____ SUCTION STOP_____ OTHER_____ FOR:_____ _____ _____	___H.G. ___ELE. ___OFF CYC. ___AIR	1ST__:___M 2ND__:___M 3RD__:___M 4TH__:___M 5TH__:___M 6TH__:___M	FAIL SAFE TIME: ___MIN.	TIME: ___MIN.	ANALOG SENSOR NO.___ SETPOINT ___DEG.F DIGITAL: _____	___ ___
_____	L.L.S_____ SUCTION STOP_____ OTHER_____ FOR:_____ _____ _____	___H.G. ___ELE. ___OFF CYC. ___AIR	1ST__:___M 2ND__:___M 3RD__:___M 4TH__:___M 5TH__:___M 6TH__:___M	FAIL SAFE TIME: ___MIN.	TIME: ___MIN.	ANALOG SENSOR NO.___ SETPOINT ___DEG.F DIGITAL: _____	___ ___

CPC1602DEFROST111088-3

* DEFROST OUTPUTS MAY BE UP TO 40 PER MCU. USE AS MANY FORMS AS REQUIRED.

1602 DEFROST SUMMARY AND SETPOINTS SHEET___OF___

JOB NAME:_____
MCU#_____
LOCATION:_____

DATE:_____
PREPARED BY:_____
SHEET___OF___

OUTPUT NO. *	DESCRIPTION	TYPE DEFROST	DEFROST START TIMES:	LENGTH OF DEFROST	LENGTH OF RUN OFF	TERM-INAT-ION	DIGITAL OV'RIDE #1 #2
_____	L.L.S_____ SUCTION STOP_____ OTHER_____ FOR:_____ _____ _____	___H.G. ___ELE. ___OFF CYC. ___AIR	1ST__:___M 2ND__:___M 3RD__:___M 4TH__:___M 5TH__:___M 6TH__:___M	FAIL SAFE TIME: ___MIN.	TIME: ___MIN.	ANALOG SENSOR NO.___ SETPOINT ___DEG.F DIGITAL: _____	___ ___
_____	L.L.S_____ SUCTION STOP_____ OTHER_____ FOR:_____ _____ _____	___H.G. ___ELE. ___OFF CYC. ___AIR	1ST__:___M 2ND__:___M 3RD__:___M 4TH__:___M 5TH__:___M 6TH__:___M	FAIL SAFE TIME: ___MIN.	TIME: ___MIN.	ANALOG SENSOR NO.___ SETPOINT ___DEG.F DIGITAL: _____	___ ___
_____	L.L.S_____ SUCTION STOP_____ OTHER_____ FOR:_____ _____ _____	___H.G. ___ELE. ___OFF CYC. ___AIR	1ST__:___M 2ND__:___M 3RD__:___M 4TH__:___M 5TH__:___M 6TH__:___M	FAIL SAFE TIME: ___MIN.	TIME: ___MIN.	ANALOG SENSOR NO.___ SETPOINT ___DEG.F DIGITAL: _____	___ ___
_____	L.L.S_____ SUCTION STOP_____ OTHER_____ FOR:_____ _____ _____	___H.G. ___ELE. ___OFF CYC. ___AIR	1ST__:___M 2ND__:___M 3RD__:___M 4TH__:___M 5TH__:___M 6TH__:___M	FAIL SAFE TIME: ___MIN.	TIME: ___MIN.	ANALOG SENSOR NO.___ SETPOINT ___DEG.F DIGITAL: _____	___ ___
_____	L.L.S_____ SUCTION STOP_____ OTHER_____ FOR:_____ _____ _____	___H.G. ___ELE. ___OFF CYC. ___AIR	1ST__:___M 2ND__:___M 3RD__:___M 4TH__:___M 5TH__:___M 6TH__:___M	FAIL SAFE TIME: ___MIN.	TIME: ___MIN.	ANALOG SENSOR NO.___ SETPOINT ___DEG.F DIGITAL: _____	___ ___

CPC1602DEFROST111088-4

* DEFROST OUTPUTS MAY BE UP TO 40 PER MCU. USE AS MANY FORMS AS REQUIRED.

SECTION IX

PARTS LIST

9.1 GENERAL. This section lists the standard and optional components for the CPC 1602 MCU. Figure 9-1 shows the layout of the circuit boards on the 1602. It is to be used as a guide should the replacement of circuit boards ever become necessary.

Table 9-1 Standard Parts List

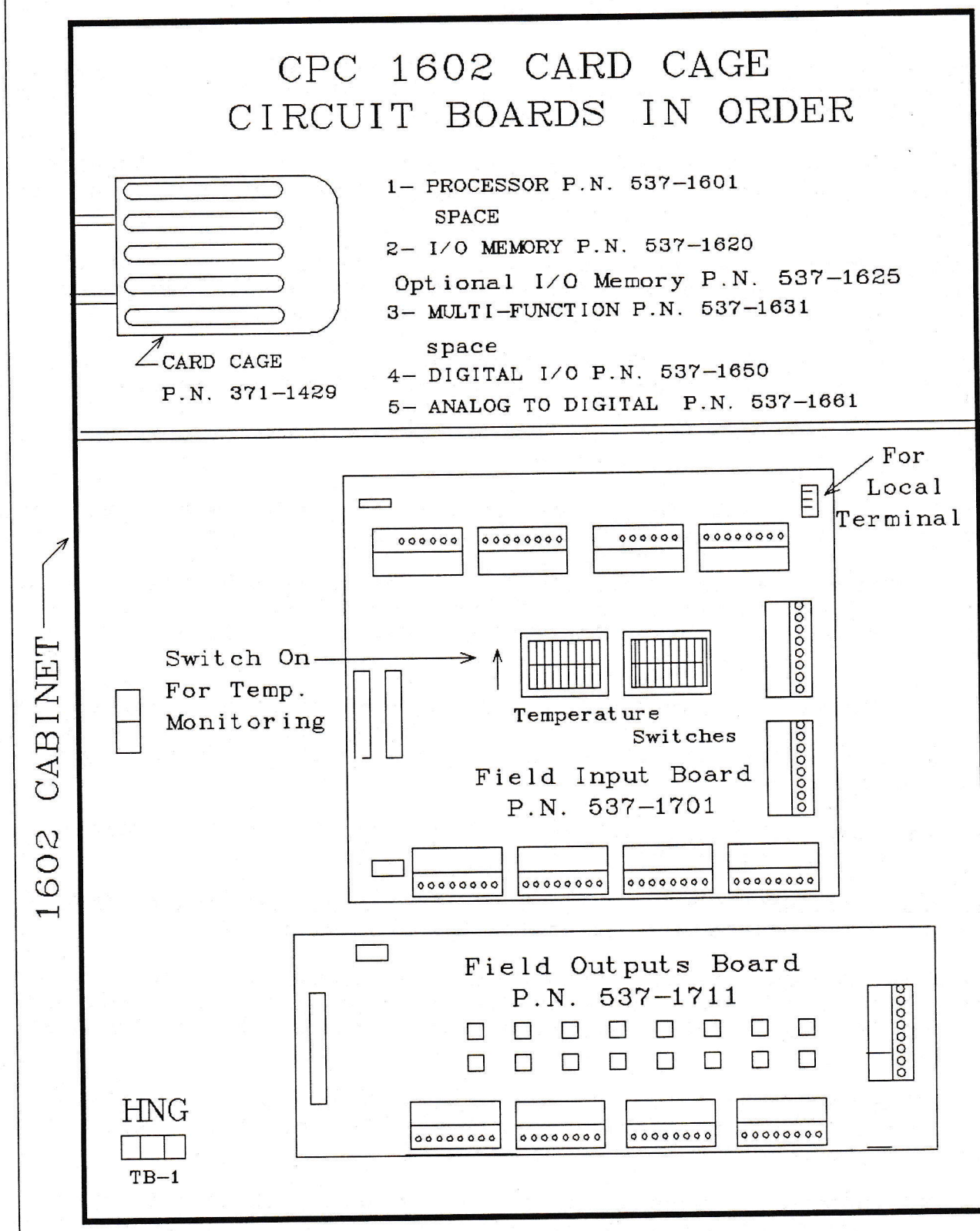
Quantity	CPC Part #	Description
1	371-1429	Card Cage
1	372-0530	Power Supply
1	537-1601	Processor Board
1	537-1620	I/O Memory Board
1	537-1631	Multi-Function Board
1	537-1650	Digital I/O Board
1	537-1661	Analog to Digital Board
1	537-1701	Field Inputs Board
1	537-1711	Field Outputs Board
1	537-1730	L.E.D. Display Board

Table 9-1 Optional Parts List (see Pricing Guide for sensors, relays, etc.)

Quantity	CPC Part #	Description
1	804-1603	Alarm Receiver 300 Baud
1	804-1612	Alarm Receiver 1200 Baud
1	805-1610	Orion Data Retrieval Hardware
1	805-1660	Orion Data-Pak Software
1	805-0123	LOTUS 123
1	370-0300	300 Baud Telephone Modem
1	370-1200	1200 Baud Telephone Modem
1	303-3701	Modem Bracket
1	380-4920	Portable Printing Terminal w/ 1200 Baud Modem
1	380-0002	Portable Video Terminal, no modem
1	380-0012	Portable Video Terminal w/ 1200 Baud Modem
1	380-0905	Desktop Terminal, no modem

Table 9-1 Optional Parts List continued

Quantity	CPC Part #	Description
1	535-1006	Cable - Terminal to Modem
1	535-1013	Cable - Terminal to Modem to 1602
1	535-1015	Cable - Modem to 1602 or 1601 or 1600
1	535-1017	Cable - 1602 to Terminal
1	810-1010	1-8RO Expansion Enclosure
1	810-2010	2-8RO Expansion Enclosure
1	810-1015	1-8RO Expansion Enclosure (with 24VAC outputs)
1	810-2015	2-8RO Expansion Enclosure (with 24VAC outputs)
1	810-1020	1-16AI Expansion Enclosure
1	810-2020	2-16AI Expansion Enclosure
1	810-2030	1-8RO, 1-16AI Expansion Enclosure
1	810-2035	1-8RO, 1-16AI Expansion Enclosure (outputs 24VAC)



1602 CIRCUIT BOARD LOCATIONS
FIGURE 9-1

SECTION X

GLOSSARY

Alarm - Analog and/or Digital. When programmed, if the setpoint is exceeded either high or low, the 1602 closes the local alarm contact and initiates the Dial-Out sequence.

Alarm Receiver - A package designed by CPC (P.N. 804-1601) to give the user a "hard copy" of all alarms that occur in the system.

Analog Input - A variable signal into the 1602 from a sensor or transducer such as a temperature sensor, a pressure transducer, a humidity sensor, dewpoint sensor, or a light sensor.

Baud Rate - The speed of which data is transmitted over a communications link. Baud Rate is in Bits per Second. (Bps)

Demand - Power required in Kilowatts at any given time to satisfy the current needs of the building.

Demand Cycle - A period of time over which the Kilowatt Demand is averaged. This time period is usually 15 or 30 minutes.

Device Number -Each CPC controller on the communications bus must have a unique identification number to distinquish it from the other controllers. This identification number is called the Device Number.

Digital Input - A dry contact (no external voltage) input to the 1602. This input can be from a switch, a relay, etc. Digital input #31 is for utility monitoring and Digital Input #32 is for a phase loss monitoring device output.

Duty Cycling - The process in which an output load is "cycled" on and off to help reduce energy consumption.

Expansion Communications Bus - The interconnecting cables through which the CPC 1602 communicates with the Expansion Devices.

Expansion Communications Network - A group of devices which communicate over the Expansion Communications Bus. These devices are the 8RO and 16AI Expansion Boards and any future Expansion Devices.

Expert Mode - An efficient way to move about the 1602 software. All menus are no longer displayed. The operator inputs the number of the specific item he chooses.

Inverted Output - When an output is inverted, it is off when its sensors, overrides, schedules, etc. call for it to be on and vice versa for it to be on. Phase loss protection remains unchanged from it's normal operation for inverted outputs.

Logs - A "history" of the conditions of the building environment. The 1602 logs Analog sensors, Overrides, daily and hourly energy usage, and all acknowledged/unacknowledged alarms.

Logging Off - The process in which the operator ends the session with the CPC controller. The operator MUST Log off one controller before Logging on to another controller.

Logging On - The process in which the operator begins the session with a CPC controller. The procedure for Logging On consists of: # $ (device no.) <RETURN>

Modem - Acronym for MOdulator/DEModulator. The modem allows communications over a standard dial up telephone line from the CPC controller to a remote receiving device.

Night Setback (NSB) - A control strategy to initiate night time analog setpoints in the 1602.

Node - Another name for a device active in the Network Communications.

Notice - A notice is programmed in the same manner as an alarm. A notice is logged as a notice but the local alarm does not close and the 1602 will not initiate the alarm dial out procedure.

Operator Terminal - An "On Site" terminal connected directly to the CPC controllers to enable the operator to program and monitor all CPC controllers from the location site.

Phase Monitor - A device which sends a DRY CONTACT closure to Input #32 (Digital) in the event that poor incoming power is detected or a phase is lost.

Pulse Generating Meter - A device which sends pulses to Input # 31 (Digital) to monitor energy usage.

Remote Terminal - A terminal located away from the site of the 1602 controllers. This terminal must be connected to a modem in order to communicate with off site CPC controllers.

Remote Communications Bus - The interconnecting cables through which CPC devices communicate with one another and the terminal.

Remote Communications Network - A group of devices which communicate over the Communications bus. These devices are a modem, printer, terminal, and CPC controllers.

Target - Used with Demand Limiting to determine at what point the 1602 initiates the Demand Limiting control strategy. When the Target is exceeded, the 1602 will shed loads according to their programmed priority.

Terminal Block - A connector into which all field wiring is terminated at the 1602.